

MUELLERIA



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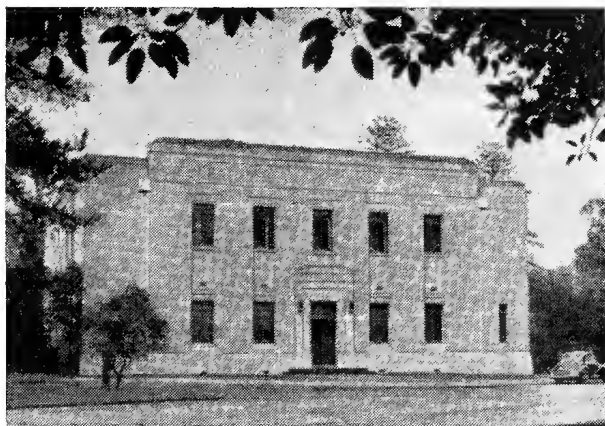
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ROYAL BOTANIC GARDENS, MELBOURNE

VICTORIA, AUSTRALIA

R. T. M. PEScott, Director and Government Botanist

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STANDARD ABBREVIATIONS FOR HERBARIA.

MEL	National Herbarium, Royal Botanic Gardens, Melbourne.
NSW	National Herbarium, Royal Botanic Gardens, Sydney.
BRI	Botanic Museum and Herbarium, Botanic Gardens, Brisbane.
PERTH	State Herbarium of Western Australia, Perth.
AD	State Herbarium, Botanic Garden, Adelaide.
HO	Herbarium of Tasmanian Museum, Hobart (at Botany Dept., University).
CANB	Herbarium, Division of Plant Industry, C.S.I.R.O., Canberra
K	Herbarium, Royal Botanic Gardens, Kew, England.
BM	British Museum of Natural History (Dept. Botany), London.

AUSTRALIAN SPECIES OF THE FUNGAL GENUS *CORDYCEPS* (Fr.) Link

(with critical notes on collections in Australian herbaria)

by

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SUMMARY

This paper embraces: a short history of the discovery of *Cordyceps* species in Australia; an artificial key to the 15 taxa (known to occur in the Commonwealth and believed to be specifically distinct); the synonymy for each species, list of collections represented in Australian herbaria, location of types, names of host-insects (where known) and sundry comments on identities and nomenclature; a bibliography concerning Australian collections of *Cordyceps*.

INTRODUCTION

Specimens of *Cordyceps* are no less intriguing to the modern botanist than when, two centuries ago, they were regarded as a *lusus naturæ*—the transmutation from animal to plant kingdom. The permanency, with which “mummified” bodies of the host-insect retain their outward form, heightens the interest of these parasitic fungi. Another remarkable fact is that certain species may occur either in the perithecial (perfect) phase or in one or more quite dissimilar conidial states. Some kinds of entomogenous fungi produce only conidial fruiting bodies; these are classified under such form-genera as *Isaria*, *Hirsutella*, *Hymenostilbe*, *Sporotrichum*, *Stilbum*, &c., although their relationship (and perhaps identity) with undoubted members of *Cordyceps* is suspected.

The only comprehensive world revision of this genus since the 19th century is by Y. Kobayasi (1941) who recognized 137 species. Japan (34 spp.), North America (31), Brazil (31), Belgian Congo (24) and Java (17) appear to be the richest centres of development. Australia (including Tasmania) is credited with only ten species, according to Kobayasi; but these include *C. taylori* (Berk.) Sacc. which is most probably the largest “vegetable caterpillar” fungus in the world, its branched sporophores often attaining heights up to 1 foot. Kobayasi notes (1941, p. 216) that almost half the total species of *Cordyceps* are known solely by the original collection, which would suggest that most species are of quite rare occurrence; however, the lack of systematic collecting doubtless accounts for an astonishing paucity

of herbarium specimens—at least in Australia. One or more species is known to occur in each of the Australian States except Western Australia, whence material of an isarioid growth on large cicada larvae (but apparently not *Isaria cicadae* Miq.) reached me during 1953. The eventual discovery of several *Cordyceps* species in such a vast region as the Western State is only to be expected.

At least three different *Isariae* have been recorded from insect larvae in eastern Australia, viz.: *I. surmatodes* McAlpine (Sept., 1895) on a cockchafer beetle at St. Kilda, Vic.; *I. cicadae* Miq. [in *Bull. Sci. phys. et nat. Neerl.* 1: 85, t. 1, fig. A (1838), also *Ann. Sci. nat.* ser. 2, 10: 378 (1838)—type from Bahia, Brazil] on a Victorian cicada specimen, but without definite locality, and *I. suffruticosa* Cooke & Massee (1889) on a hairy caterpillar in New England district, N.S.W. The two latter records were published by M. C. Cooke (Aug., 1892, p. 383), and H. T. Tisdall (1893, p. 94) discusses an unidentified *Isaria* found on a moth cocoon under a charred log at Nar-Nar-Goon, Vic.

It is now possible to extend the range of *I. cicadae* to Queensland, where excellent fruiting material was collected on the ground in eucalypt forest at Mt. Nebo, Manorina National Park, by Mr. and Mrs. A. B. Cribb in February, 1956. The highly branched conidiophores all emerge from the head of the small host-cicadas (apparently *Melampsalta* sp.) and the flesh-pink to orange-reddish fertile heads (each about 2 mm. long) are aggregated like bunches of grapes. Under *I. cicadae*, Petch (1933, p. 65) lists as a synonym *I. sinclairii* (Berk.) Lloyd, 1923, which is not uncommon in New Zealand, its type (at Kew) having come from Tauranga on Poverty Bay. Dingley (1953, p. 339) is not correct in writing "Petch stated that the perfect stage was *Cordyceps sobolifera* (Hill.) Sacc." Petch's actual words (1933, p. 64) were: "*Isaria sinclairii* is generally accepted as the conidial stage of *Cordyceps sobolifera*, though no evidence of that relationship has been adduced, except that both grow on *Cicada* nymphs".

Type of *Cordyceps sobolifera* (Berk.) Berk. & Broome, 1875, came from the West Indies and is, presumably, in the cryptogamic section of the Natural History Museum at Paris. This species, with usually solitary clubs surrounded by sterile, conidiophore-like "soboles", extends to Mexico, Japan, China, Ceylon and Madagascar; so it might well be represented in the Australian region.

H. Tryon (1893, p. 54) reported the occurrence of a hyphomycetous fungus—probably *Isaria* sp.—on a mummified scarabaeid beetle larva at Yandilla, Queensland, while the present writer has found white but barren isarioid growths (to 1 cm. high) all over the brown-woolly cocoon of a grass moth (*Anthela acuta* Walk.) at Beenak, Vic. (May, 1935). The latter may possibly represent *I. suffruticosa* Cooke & Massee, to which *I. japonica* Yasuda ex Lloyd, 1917, is very closely allied if not conspecific. Mrs. K. Healey has recently found excellent examples of the same parasite on woolly moth cocoons at Tarra Valley National Park, Vic. (June, 1959).

Cordyceps is known to parasitize a wide diversity of hosts, including larvæ of numerous genera of *Coleoptera* (beetles), *Hemiptera* (bugs and cicadas), *Orthoptera* (cockroaches and crickets), *Lepidoptera* (moths and butterflies), *Hymenoptera* (ants and wasps) and *Diptera* (flies). It is usual for fruiting bodies to emerge just behind the head of the host, but occasionally they appear between the anal or intermediate segments. Occurrences of *Cordyceps* on spiders are comparatively rare (e.g., the Japanese *C. arachneicola* Kobayasi, and tropical American *C. caloceroides* Berk. & Curt.), while a few boreal species—*C. japonica* Lloyd, *C. jezoensis* Imai, *C. ophioglossoides* (Fr.) Link, *C. intermedia* Imai and *C. capitata* (Fr.) Link—are restricted to underground fruiting bodies of the fungal genus *Elaphomyces*. Frequently each *Cordyceps* is peculiar to a single host or to several related species, yet the almost cosmopolitan *C. militaris* (Fr.) Link has been recorded for at least 13 genera of *Lepidoptera*, as well as on coleopterous pupae and the cocoons of certain *Hymenoptera*. Conversely, the large Victorian swift moth larva *Oxycanus diremptus* is known to be parasitized by at least four species of *Cordyceps*: *C. gunnii* (Berk.) Berk., *C. hawkesii* G. R. Gray, *C. cranstounii* Olliff and *C. robertsii* (Hook.) Berk. were all found on this grub within an area of a few square yards along Koonung Creek at Doncaster, Vic., by Mr. and Mrs. Paul Fisch in June, 1942, and more recently (June, 1959) the same four species were gathered on *Oxycanus* at Tarra Valley National Park, Vic., by Mrs. K. Healey (*vide* specimens in Melbourne Herbarium).

The writer has personally examined all *Cordyceps* exsiccatae housed in the National Herbaria at Melbourne and Sydney, the National Museums of Victoria and South Australia, the considerable material in the Botany Department of Melbourne University (amounting to 22 collections, including types of three species) and, by courtesy of Dr. N. T. Flentje (pathologist), eight of the twelve collections of *Cordyceps* in the Waite Agricultural Research Institute at Adelaide. He is also indebted to Dr. Winifred M. Curtis, Mr. R. C. Carolin and Mr. A. Musgrave (through Director J. W. Evans) for valuable information on the material housed in the respective herbaria of Hobart University, Botany Department at Sydney University and the Australian Museum (Sydney). There are no Australian specimens in the State Herbaria at Perth, Adelaide or Brisbane.

Special thanks are due to Dr. Alan B. Cribb (Botany Department, University of Queensland, Brisbane) who willingly placed at my disposal the four *Cordyceps* collections (1954–56) of his own fungal herbarium, and gave permission to publish any pertinent details. These collections (all by Cribb and his wife) comprise four distinct species—*C. gunnii*, *C. hawkesii*, *C. robertsii* and *Isaria cicadæ* Miq.—none of which have been recorded previously for Queensland; indeed, the genus *Cordyceps* would seem to have been hitherto quite unknown in that State. All three species came from rain forest along Coomera track in the Lamington National Park—presumably on the same large hepialid moth larva (as happened at Doncaster, Vic., in 1942). It is possible that some other important collections exist in private herbaria; but, if so, details have eluded me.

RECORDING OF SPECIES FOR AUSTRALIA

Apparently the first species to be discovered in the Australasian region was *C. robertsii*, diagnosed as a *Sphaeria* by W. J. Hooker (1836) from New Zealand material, but later recorded for Tasmania (Rodway, 1920), found in Victoria (1942), in New South Wales (1947)* and Queensland (1955). Kobayasi (1941, p. 102) extends its range to Chile. The host in each instance is a large lepidopterous larva in the Swift Moth family, *Hepialidae* (e.g., *Oxycanus diremptus* and probably *O. fusco-maculatus*).

A second Australasian species was collected on the banks of Murrumbidgee River near Yass, N.S.W., in 1837; it was first described and figured as *Sphaeria innominata* by Rev. R. Taylor (1842), but has been universally known under the name *Cordyceps taylori* for the past century—the inadmissibility of the latter, and probably both epithets, will be discussed elsewhere. In 1896 *C. taylori* was rediscovered at Queanbeyan, less than 40 miles south-east from the type locality; in the meantime, however, no less than six independent collections had been made in the Otway Ranges, Vic. (1886–94), two between the Ovens and Mitta Mitta Rivers, two in the Strzelecki Ranges of South Gippsland and one labelled “Caulfield” (1870). This large and remarkable ascomycete is still known only from Victoria and south-eastern New South Wales.

The third Australian taxon to receive recognition was *C. gunnii*, described under the genus *Sphaeria* by Rev. M. J. Berkeley (1848) on the basis of a Tasmanian collection from Launceston district—not “Lancaster” as in the original description. This is the most widely distributed and by far the best known Australian species, occurring in all States except Western Australia and extending also to the North Island of New Zealand. Its large, usually simple, dark olive-green heads appear early in winter, mostly under *Acacia* trees (e.g., the Silver Wattle, *A. dealbata*), and fruiting bodies are well represented in herbaria. The first Victorian specimen would seem to be one taken at Studley Park, Melbourne, in 1857 by W. Kershaw and now in the possession of his great-grandson (R. C. Kershaw of West Tamar, Tas.); strangely enough, F. Mueller does not seem to have noticed the species before 1874, when it appears in his *Report* as Government Botanist (p. 12). Subsequent collections have been made almost throughout the cooler parts of the State—from Portland to Mallacoota.

C. gunnii was collected in New South Wales at least as early as 1888 (Shoalhaven River), on the Hunter River, then at several parts of the Blue Mountains, and later still in the National Park (south of Sydney) and in the Riverina district. Tepper and McAlpine (1897) recorded the species for South Australia on the basis of several collections from Kingston and Sellick's Hill. By courtesy of the Director, South Australian Museum, the present writer has been able to examine three of these collections and he agrees with McAlpine's identifications of 1897. Almost half a century later (in 1942 and 1943) *C. gunnii* was collected at Kingston again and

* Several collections from the Port Jackson area were recorded under the name of *Cordyceps selkirkii* by Olliff (1895).

the record published, together with a coloured illustration, by J. R. Harris (1946). No other species of the genus is known to occur in South Australia. The first, and only, Queensland collection would seem to be that of A. B. and J. W. Cribb—from Lamington National Park in the far south-east, May 1955.

C. hawkesii was described (as a *Sphaeria*) from Tasmania by G. R. Gray (1858). The type, presumably at British Museum (Natural History), has not been consulted; but similar, or perhaps identical, material was collected on the Snowy River near Orbost, Vic. (1890)—subsequently at Doncaster, Cockatoo, Olinda, &c.—at Coonamble, N.S.W. (about 1894), and lastly in the Lamington National Park, Queensland (May, 1954).

F. Mucller and Berkeley (1878) published a description and figure of *C. meneristitis* (the epithet erroneously rendered "*menesteridis*"), their type coming from the mouth of Yarra River, Vic.; M. C. Cooke (Aug., 1892) reduced it to a variety of the European *C. entomorrhiza* Link, and Kobayasi (1941, p. 140) made it a doubtful synonym of his own new Japanese species, *C. gracilioides*.

The *Stilbum formicarum*, described by Cooke and Masee (1889) from an ant collected at Cheltenham, Vic., was considered by T. Petch (1933, p. 67) as referable to a conidial state of the Brazilian *C. bicephala* Berk.

Only three species of *Cordyceps* were accorded an Australian distribution by Saccardo (1883) and Cooke (Aug., 1892) in their respective fungus floras of the world and of Australia. *Saccardo omitted *C. hawkesii*—probably not having seen Gray's private and rather obscure pamphlet of 1858—and the latter authority, for some inexplicable reason, failed to mention *C. taylori*. D. McAlpine (1895) listed the four species known from Australia at that date (viz., *C. taylori*, *C. hawkesii*, *C. gunnii* and *C. entomorrhiza* var. "*menesteridis*"); he also admitted typical *C. entomorrhiza* for Victoria.

The next comprehensive account of Australian species appeared in June, 1895, by A. S. Olliff, Government Entomologist of New South Wales, who died six months later at the early age of 30. He provided illustrations and diagnoses for six species, believed to be new, making a total for the Commonwealth of ten. Although this attempt to name several apparently undescribed entities was praiseworthy enough, Olliff was not a botanist and his revision called forth adverse criticism. L. Rodway (1900) remarked:

Mr. Olliff . . . drew attention to the forms found in Australia, at the same time describing many forms as new species. I doubt if mycologists will accept them all. *C. selkirkii* and *C. coxii* are too close to *C. larvarum* [= *C. robertsii*] and *C. trictenæ* owes its existence to an unfortunate oversight. . . .

And C. G. Lloyd's opinion (1920) concerning the same revisionist was expressed thus:

From the systematic account of *Cordyceps*, however, Mr. Olliff seems to us to be very local in his view, and his species, we believe, should mostly be referred to others.

* Saccardo later listed *C. hawkesii* in *Sylloge Fungorum* 9 (*Supplementum Universale*): 1001 (1891).

One of Olliff's six "new" species (*C. selkirkii*) is almost certainly a form of *C. robertsii*, another (*C. pيلي*) seems to be merely *C. hawkesii*, while a third (*C. trictenæ*) is actually based upon the type illustration of *C. taylori* (published as *Sphaeria taylori* Berk., 1843)! The remainder (*C. scottiana*, *C. coxii* and *C. cranstounii*) appear to be genuine novelties, worthy of specific rank, but their types have not been located and their circumscription must rest upon the original figures and rather inadequate descriptions. A possible type specimen of *C. coxii* is preserved in the Insect Gallery at the Australian Museum, Sydney; this has not been examined by the present writer.

C. scottiana is not known other than by the type collection (Hunter River, N.S.W., 1861) which may be among Berkeley's numerous fungi at Kew; the original specimens of both *C. coxii* and *C. cranstounii* came from Kurrajong Heights, N.S.W.; but collections conforming well to the descriptions of these entities have been made in Victoria during the past twenty years.

Also in 1895 G. Massee published another new species, *C. henleyæ*, the type coming from Ovens River, Vic., in 1893. E. Cheel, as reported by Lloyd (1920), made the suggestion that *C. henleyæ* was merely a branched condition of *C. robertsii*; it seems to connect this species with *C. taylori*, and, in my opinion, would be better placed as a form of the latter (with which it shares the same very large hepialid host-larva). In C. G. Lloyd's *Synopsis of the Cordyceps of Australasia* (1915), *C. henleyæ*, *C. taylori*, *C. gunnii*, *C. dovei* [see below] and *C. gracilis* are considered as "good" Australian species; to the last-named Algerian species Lloyd referred *C. meneristitis* F. Muell. & Berk.

During the present century five species have been added to the *Cordyceps* flora of the Commonwealth—four from Victoria and one from Tasmania: *C. dovei* Rodway (1900) was presented from Mt. Bischoff, western Tasmania, and later noted in the North and South Islands of New Zealand; *C. furcata* McLennan & Cookson (1923) and *C. brittlebankii* McLennan & Cookson (1926), both described from Ringwood, Vic.; *C. aphodii* Matthieson (1949) from Miner's Rest, near Ballarat, Vic.; and what appears to be a form of the boreal genotype, *C. militaris* Link, from chrysalids in the Otway Ranges, Vic. (first noted in Sept., 1935, and collected there again during the next two years). From time to time, there are found in Australia *Cordyceps* fruiting bodies which do not satisfactorily match the existing descriptions, and it is likely that a number of endemic species still awaits recognition—especially those on small or little-known insects.

Joan M. Dingley's monograph (1953) on the *Hypocreales* of New Zealand includes eight species of *Cordyceps* (three being new to science) and is the most recent treatment for a large region in the Southern Hemisphere. She assigns *Cordyceps*, and five other genera, to the family *Clavicipitaceæ*. The three species (*C. robertsii*, *C. gunnii* and *C. dovei*) common to Australia and New Zealand are described in detail. Probably one or more of the four species, at present considered endemic in that Dominion, may extend to Australia.

ARTIFICIAL KEY TO AUSTRALIAN *CORDYCEPS* SPECIES.

1. Perithecia entirely immersed in stroma—6
Perithecia superficial or very prominently exerted—2
2. Fertile portion of sporophore *terminal, orange, obtuse, unbranched, 2–20 mm. long* (on chrysalids of various *Lepidoptera*)—*C. militaris*
Fertile portion not terminal, never orange; apex of sporophore sterile, often slender (on larvæ)—3
3. Stroma 3–10 mm. long, 1–2 mm. wide, *pale ochraceous*; perithecia darker, forming irregular, often lateral pads 3–5 mm. long and occupying the greater part of fructification (on cerambycid, or longicorn, beetle grubs—several to many, rarely only 1–2, sporophores crowded around neck of host)—*C. dovei*
Stroma > 30 mm. long (and up to 20 cm.), *bay brown*; perithecia *dark brown* to blackish—4
4. Stipe *glabrous*, very slender, simple or forked; perithecia *acute, 0.2–0.3 mm. long* (on scarabæid, or cockchafer, beetle larvæ)—*C. coxii*
Stipe *brown-tomentose* toward base; perithecia *obtuse* (on large moth larvæ)—5
5. Fructification simple or slightly branched, *slender, never > 3 mm. wide* (usually 1–2 mm.) at junction with host; perithecia *truncate, ± 4 per mm., 0.3–0.5 mm. long* (host < 15 mm. thick)—*C. robertsii*
Fructification usually much branched, antler-like and *massive* (or, if occasionally simple, then > 3 mm. wide at point of emergence from host); perithecia often ± apiculate, 5–6 per mm., 0.1–0.2 mm. long (host ± 20 mm. thick)—*C. taylori*
6. Stipe *hair-like, ± 5 cm. long, simple or once-forked, smooth, dark brownish*; capitula almost *globose, 2–3 mm. long* (on ants—the perithecial stage unknown in Australia, where small pink-headed conidiophores spring from various parts of host)—*C. bicephala*
Stipe neither hair-like nor associated with ants—7
7. Fructification very *small* (< 3 cm. long) but relatively stout, often *multiple* or branched; capitulum < 5 mm. long—12
Fructification > 3 cm. long, frequently single and simple; capitulum at least 5 mm. long (often more)—8
8. Capitulum dark reddish-brown, 5–10 mm. long, with paler and usually acute *sterile terminal beak* (4–8 mm.); stipe 1–2 mm. wide (on scarabæid beetle larvæ)—*C. brittlebankii*
Capitulum fertile up to the obtuse, rounded apex—9
9. Stipe > 3 mm. wide (often up to 10 mm.), undivided, sometimes 20–30 cm. long; capitulum normally > 10 mm. long (on hepialid moth larvæ)—11
Stipe < 3 mm. wide or irregularly much branched; capitulum to 10 mm. long—10
10. Mouths of perithecia *distinct and widely spaced* (4–7 per mm.); stipe very flexuose, irregularly branched (with several yellow capitula) and *lucerate* (on hepialid moth larvæ)—*C. cranstounii*
Mouths of perithecia microscopic, > 7 per mm.; stipe *undivided, smooth*; capitulum *brick-reddish or sepia, 5–8 mm. long* (on tenebrionid beetle larvæ)—*C. meneristitis*
As for the last, but the *yellow-brown* capitulum ± 10 mm. long and host a *lucanid beetle larva*—*C. scottiana*
11. Living capitulum dark *olive-green to blackish*, ill-defined below where it merges gradually into the pale yellow stipe, usually with small longitudinal wrinkles or creases and protruding perithecial mouths in the dried state—*C. gunnii*
Living capitulum *bay or coffee-brown*, well-defined and sharply distinct from the paler brown stipe, not wrinkled in drying—*C. hawkesii*
12. Capitula 3 per stipe, each 4–5 mm. long, *red-brown, regularly ovoid*, sharply contracting into a nipple-like apical point (identity of larval host unknown)—*C. furcata*
Capitulum *solitary, 3–4 mm. long, ochre-brown*, sometimes ± *distorted* (on scarabæid, or cockchafer, beetle larvæ)—13
13. Perithecia ± *scattered, obliquely inclined* toward axis—*C. aphodii*
Perithecia close and *compact, perpendicular* to axis—*C. sp.*

ALPHABETICAL ARRANGEMENT OF SPECIES, SYNONYMY, HOSTS, LOCATION OF TYPES, AND COLLECTIONS IN AUSTRALIA

The following standard abbreviations have been used for various herbaria (the numbers in brackets indicating collections of Australian *Cordyceps* material housed in each local herbarium):

ADM (3)	South Australian Museum, Adelaide.
ADW (12)	Waite Agricultural Research Institute, Adelaide.
BDW	Botany Division, Department of Scientific and Industrial Research, Wellington, N.Z.
BM	British Museum (Natural History), London.
CANTY	Canterbury Museum, Christchurch, N.Z.
HO (10)	University of Tasmania (Botany Department), Hobart.
K	Royal Botanic Gardens (Herbarium), Kew, London.
LPS	Institute de Botanica C. Spegazzini, La Plata, Argentina.
MEL (40)	National Herbarium, Royal Botanic Gardens, Melbourne.
MELM (12)	National Museum of Victoria, Melbourne.
MELU (22)	University of Melbourne (Botany School).
NSW (9)	National Herbarium, Royal Botanic Gardens, Sydney.
PR	Botanical Department of National Museum, Prague, Czechoslovakia.
SYD (5)	University of Sydney (Botany Department).
SYDM (5)	Australian Museum, Sydney.
US	National Museum and Smithsonian Institute, Washington (including Lloyd Herbarium, now under loan to Plant Industry Station, Beltsville, Md.).

C. aphodii J. Mathieson in *Trans Brit. mycol. Soc.* **32**: 134, t. 12-14 (1949).

Host: *Aphodius howitti* Hope (Coleoptera—Scarabæidæ).

Type: Miner's Rest, near Ballarat, Vic. (J. Mathieson, Oct., 1946—MELU).

Other Collections: Miner's Rest, near Ballarat, Vic. (J. Mathieson, July, 1945—MELU, asexual stage).

The author of the species gives a very detailed account of all stages of the parasite, its artificial culture from both conidiospores and ascospores, secondary parasites which attack it and the life history of the host-insect (a small cockchafer beetle in the family Scarabæidæ). *C. aphodii* has not been reported beyond the type area in Victoria, but a very similar, still undetermined, species from New South Wales is discussed on page 85.

? **C. bicephala** Berk. in *Hook. J. Bot. Kew Gdn Misc.* **8**: 278 (1856).

C. australis (Speg.) Sacc. *Syll. fung.* **2**: 571 (1883);

C. unilateralis Tul. supsp. *australis* Speg. in *An. Soc. cient. argent.* **12**: 215 (1881)—TYPE (? LPS) on *Pachycondyla striata* from mossy trunks near Apiahy, southern Brazil (Dr. Puiggari);

Hymenostilbe melanopoda (Speg.) Petch in *Trans. Brit. mycol. Soc.* **16**: 209 (1932);

Isaria melanopus Speg. *Bol. Acad. Cienc. Cordoba* **11**: 620 (1889)—TYPE (? LPS) on decayed beetle from mossy trunks near Apiahy, Brazil (Dr. Puiggari);

Stilbum formicarum Cooke & Massee in *Grevillea* **18**: 8 (1889)—TYPE (K) on an ant, "*Formica consobrina*", from sundew plant at Cheltenham, Vic. (C. French, ± 1888).

Host: Unknown (probably ant).

Type: Panure, near sources of Rio Negro, N.W. Brazil (R. Spruce, \pm 1853 — K).

The synonymy given above reflects the opinion of T. Petch (1933, p. 67). It is generally conceded that the two taxa *C. bicephala* and *C. australis* (both described from Brazil) are conspecific, and it is practically certain that *Hymenostilbe melanopoda* (type of which came from the same tree-trunks as that of *C. australis*) is only a conidial stage of this species; but, since many distinct species of *Cordyceps* are known to parasitize ants, it is surely assuming too much to identify the single old Victorian collection of *Stilbum formicarum* with the perfect stage of a South American fungus? They may indeed be the same, but my doubt is expressed by the prefixing query to *C. bicephala* in this list of Australian *Cordyceps*.

E. B. Mains [*Bull. Torrey bot. Cl.* 76: 24–30 (1949)] supports Kobayasi (1941, p. 183) in taking up the name *C. australis* instead of the earlier *C. bicephala* Berk., because the latter was presumed to be based on a doubtfully mature specimen; but Berkeley's diagnosis explicitly mentions both asci and sporidia, and, in any case, the International Code of Nomenclature does not sanction rejection of any name on a plea of immaturity for the type on which it is based. Petch, in his belief that only a single species was involved, had every justification for synonymizing *C. australis* under *C. bicephala*. Kobayasi has extended the range of this fungus to Uganda in East Africa, and Mains (*l.c.*) presents it as a common parasite in the Western Province of Liberia, West Africa, "killing ants by thousands".

C. brittlebankii E. McLennan & I. Cookson in *Proc. roy. Soc. Vict.* n. ser. 38: 74, t. 5 fig. 5–6, t. 6 fig. 4–5 (1926).

Host: *Heteronyx* sp. (Coleoptera—Scarabæidæ).

Type: Ringwood, Vic. (I. Cookson, Apr. 1924—MELU).

Other Collections: Tyabb, Vic. (J. M. Raff—MELU).

The species has not been observed outside Victoria.

C. coxii Olliff in *Agric. Gaz. N.S.W.* 6: 412, t. 4 fig. C–D (1895).

Host: ? *Lepidiota* sp. (Coleoptera—Scarabæidæ), also Cicadidæ (Hemiptera).

Type: In vicinity of turpentine trees at Kurrajong Heights, N.S.W. (T. Cranstoun, ? Mar., 1895 — ? SYDM).

Other Collections: Concord, N.S.W. (F. C. Lovegrove, Aug., 1910—NSW); near Gembrook, Vic. (J. H. Willis, 1935—MEL); Between Daylesford and Trentham, Vic. (Judith Thiele, July, 1946—MEL); Alexandra, Vic. (C. G. Lane, Nov., 1907—MELM). [At the Entomological Branch of the N.S.W. Department of Agriculture, the writer has seen a collection of *Cordyceps*-bearing cockchafer larvæ from Taren Point on Botany Bay (E. E. Mellenish, Dec., 1934); the fruiting bodies on these are imperfect, without perithecia, but most probably referable to *C. coxii*.]

Although type of *C. coxii* has not been examined, the original figures and description (brief as it is) accord well with later collectings of a distinctive *Cordyceps* on cockchafer larvæ, which is here referred to that species.

Olliff (*l.c.*) suggests that *C. coxii* "may prove to be an extreme variety" of his species *C. selkirkii*, the latter always parasitizing large moth larvæ and differing in its longer, truncate, less crowded perithecia. The writer unhesitatingly supports Lloyd (1920, p. 912), Kobayasi (1941, p. 99) and Dingley (1953, p. 331) in relegating *C. selkirkii* to synonymy under *C. robertsii*, but he does not uphold Kobayasi's treatment of *C. coxii* as another straight synonym of "*C. larvarum*" [i.e., of *C. robertsii*].

C. cranstounii Olliff in *Agric. Gaz. N.S.W.* 6: 408, t. 2 fig. B (1895).
(Plate VIII).

Host: *Oxycausus diremptus*, and probably other species (*Lepidoptera*—*Hepialidæ*).

Type: Kurrajong Heights, N.S.W. (*T. Cranstoun*, Mar., 1895 —? *loc.*).

Other Collections: Bola Creek, National Park, N.S.W. (*A. Burges*, July, 1947—MEL); Koonung Creek, Doncaster, Vic. (Mr. & Mrs. *Paul Fisch*, June, 1942—MEL, ADW No. 3142); without locality, Vic. (MELM); Tarra Valley Nat. Park, Vic. (Mrs. *K. Healey*, June, 1959—MEL).

The characteristic features of *C. cranstounii* are its *lacerate* (or irregularly byssaceous) stipe, multiple heads which are relatively short, obtuse, yellowish, with perithecial orifices large and *widely spaced*.

Type was not available for inspection, but the writer confidently refers the Bola Creek (N.S.W.) and Doncaster (Vic.) collections to this distinctive species.

Many fresh specimens from Doncaster were examined over a period of four months; but, although the fruiting heads of these had well-developed perithecia, in no instance could sporidia (or even differentiated asci) be found!

C. dovei L. Rodway in *Pap. roy. Soc. Tasm.* 1898–1899: 101, *cum icon.* (1900).

C. aemonæ Lloyd *Mycol. Notes* 6⁶²: 932, fig. 1695 (1920)—TYPE (US) on *Aemona hirta* in rotting logs of *Melicytus ramiflorus*, Weraroa, New Zealand (*G. H. Cunningham*, No. 51, Sept., 1919); CO-TYPE (No. 78, ? BDW).

Host: (*Coleoptera*—*Cerambycidæ*).

Type: In decayed trunk of *Nothofagus cunninghamii* at Mt. Bischoff, Tas. (*H. Stuart-Dove*—HO; photo. of type MEL).

Although six collections have been recorded from New Zealand (widely distributed through both islands), the only one known from Australia is that of the type which came from the high-rainfall area of western Tasmania. In its comparatively very small fructifications (with sterile apices and half-exserted perithecia), more or less crowded near the head of the beetle-host, *C. dovei* is almost unique. New Zealand populations differ slightly from the Tasmanian in having longer, more slender, less crowded stromata (sometimes even single), with the fertile portions more distinctly lateral and sterile tips less truncated (sometimes acute). Lloyd recognized them as constituting a separate endemic species, *C. aemonæ*, but Kobayasi (1941, p. 103) reduced this to synonymy and pointed out the trifling nature of the differences.

C. furcata E. McLennan & I Cookson in *Proc. roy. Soc. Vict.* n. ser. **35**: 157, t. 10 (1923).

Host: Unknown larva.

Type: Ringwood, Vic. (E. McLennan & I. Cookson, Sept., 1922—MELU).

The species is known only by the single type collection.

C. gunnii (Berk.) Berk. in Hook. f. *Flor. Tasin.* **2**: 278 (1859).

(Plate IX, figs. 1–3).

Sphaeria gunnii Berk. in *Lond. J. Bot.* **7**: 577, t. 22 (1848);

C. consumpta G. H. Cunn. in *Trans. N.Z. Inst.* **53**: 377, t. 60 fig. 1 (1921)—
TYPE (No. 230, CANTY) on buried larva of *Porina* sp. [= *Oxycanus*
sp.] at Rotorua, N.Z. (*A. Lush*, June, 1920);

? *C. craigii* Lloyd *Mycol. Notes* **4**³⁹: 527, fig. 718 (1915)—TYPE (US) on
Porina ensyii [= *Oxycanus ensyii*] from old and abandoned kumara
(*Ipomœa batatas*) beds at Auckland, N.Z. (*E. Craig*);

? *C. hillii* Lloyd *Mycol. Notes* **6**⁶⁵: 1061, fig. 1994 (1921)—TYPE (US) from
N.Z., without details (*H. H. Hill*).

Host: *Oxycanus* spp. (*Lepidoptera*—Hepialidæ).

Type: Franklin Village, near Launceston, Tas. (*R. C. Gunn*, No. 1800,
Apr., 1846—K, NSW).

Other Collections:

Tasmania—Knocklofty, Hobart (? *L. Rodway*, June, 1895—
HO); without locality (*W. V. Fitzgerald*, 1891—MEL); Strzelecki
Peak, Flinders Island (*J. H. Willis*, Apr. 1954—MEL).

Victoria—? Dimboola (*E. Muir*, 1948—MEL); Bahgallah,
near Casterton (*R. C. Miller*, June, 1885—MEL); Portland (*J. A.*
Leach, June, 1906—MEL); Macedon (MELU); Apollo Bay
(MELU); Port Phillip (*C. French*, June, 1869—MEL); Studley
Park (*W. Kershaw*, 1857—Herb. *R. C. Kershaw*; *F.M. Reader*,
June, 1885—Herb. Vict. Dept. Agric., Burnley); “Comellia”
(*C. French*, May, 1900—Herb. Vict. Dept. Agric., Burnley);
Kew (MELU); Doncaster (*P. Fisch*, June, 1942—MEL, MELU);
Dandenong (*F. Gessner*, 1892—MEL); Kallista (*E. I. McLennan*,
Aug., 1949—MELU); Dandenong Ranges (MEL); Kalorama
(Mrs. *Peters*, May, 1957—MELM); Mornington (MELU); Tyabb
(Master *Blackwood*, Nov., 1920—MELM); Nyora (MELU);
Korumburra (MELU); Orbst (MELU); Mallacoota (*W. Hunter*,
Oct., 1955—MEL); Wangaratta (*M. Ferris*, June, 1956—ADW
No. 7450); Tarra Valley Nat. Park (Mrs. *K. Healey*, June, 1959—
MEL).

[Noted also as abundant at Emerald and Cockatoo.]

South Australia—Penola (*C. Barrett*, June, 1931—MELU);
Sellick’s Hill (Dr. *E. C. Stirling*—ADM); Kingston (Dr. *A.*
Engelhardt—ADM; *J. B. Cleland*, Aug., 1943—MEL; June, 1943
—ADW Nos. 266–268; *J. B. Cleland*, July, 1942—ADW
No. 3143; *A. R. Naimes*, Aug., 1945—ADW No. 3145).

New South Wales—Shoalhaven River (? W. Bäuerlen, June, 1888—MEL); Kurrajong Heights (SYDM); Bola Creek, National Park (J. McLuckie, A. Burges & N. White, June, 1932—SYD); Whitton, Murrumbidgee River (A. J. Foster, June, 1921—NSW No. 3486/21); near Albury (A. G. Hamilton, June, 1917—NSW).

[Noted also in the Blue Mountains and on Hunter River.]

Queensland—Rain forest in Lamington National Park (A. B. & J. W. Cribb, May, 1955—Herb. A. B. Cribb, Brisbane).

The common big-fruited *C. gunnii* is very closely related to, and has been much confused with, *C. hawkesii*—or what the writer interprets as that species. In the latter fungus the capitulum is brownish (*not* dark green); remaining quite smooth and unaltered when dry. Furthermore, there is a *sharp line of demarcation* between the apex of stipe and fertile (perithecia-bearing) part of the sporophore; in *C. gunnii*, by contrast, the dark green (at length black and wrinkled) fertile portion grades insensibly into a yellow stipe and the perithecial mouths protrude slightly when specimens are dried. Joan Dingley (1953, p. 335) has reduced the names of Lloyd's two New Zealand species *C. craigii* and *C. hillii* (*l.c.*) to synonyms of *C. gunnii*, apparently without inspection of their types; but the original figures of both show rather well delimited capitula and might equally pass for *C. hawkesii*, hence the present writer's query prefixing the synonymy of these under *C. gunnii*. Miss Dingley kindly made available for examination two excellent specimens of *Cordyceps* from New Zealand, collected about 1920 by H. Hamilton on the larvae of *Oxycanus enysii* at Wireless Hill, near Wellington. These had been determined by Dr. G. H. Cunningham at *C. craigii* Lloyd; but they are certainly referable to a small form of *C. gunnii*, with which Dingley also identified this collection (1953, p. 335). Probably both *C. gunnii* and *C. hawkesii* occur in New Zealand.

***C. hawkesii* (G. R. Gray) Cooke in *Grevillea* 19: 76 (1891).**

(Plate IX, figs. 4-6).

Sphaeria hawkesii G. R. Gray *Notices Insects* . . . *Fungoid Parasites* 8, t. 5 fig. 10-12 (1858).

? *Cordyceps pieli* Olliff in *Agric. Gaz. N.S.W.* 6: 412, t. 2 fig. A (1895)—
TYPE (N.S.W.) on caterpillar of *Trictena labyrinthica* Don at Coonamble,
N.S.W. (J. H. Rose, c. 1894).

Host: Oxycanus & Trictena spp. (*Lepidoptera*—Hepialidæ).

Type: Near Launceston, Tas. (Mr. Hawkes, ca. 1846—? BM).

Other Collections: Mussel Roe, N.E. Tas. (? L. Rodway—HO); Track to Marriott's Falls, Mt. Field National Park, Tas. (O. Rodway, Sept. 1924—HO); Koonung Creek, Doncaster, Vic. (Mr. & Mrs. Paul Fisch, June, 1942—MEL, ADW No. 3144); Perrin's Creek, Olinda, Vic. (Ina Watson, July, 1942—MEL); Mt. Evelyn Recreation Reserve along Olinda Creek, Vic. (A. B. Court, July, 1958—MEL); Tarra Valley Nat. Park, Vic. (Mrs. K. Healey, June, 1959—MEL); Snowy River near Orbost, Vic. (J. Cameron, 1890—MEL, as "*C. cameroni*" ms.); without locality, Vic. (MELM); Coonamble, N.S.W. (TYPE *C. pieli*, *l.c.*); Rain forest in Lamington National Park, Q'land (A. B. & J. W. Cribb, May, 1954—Herb. A. B. Cribb, Brisbane).

Until the actual type of *C. hawkesii* can be located and studied, its circumscription must depend upon G. R. Gray's three drawings and rather hazy account (*l.c.*). Gray was Senior Assistant at the Zoology Department, British Museum, and he stated unequivocally "Various examples . . . are among the specimens sent by Mr. Hawkes to the British Museum"; yet C. G. Lloyd (Mar., 1915, p. 6) avers "I found no specimen of *Cordyceps hawkesii* in either of the museums at London"—one wonders whether his search extended to the Zoological Department as well as the Botanical? No other writer seems ever to have examined the original material of this parasite. The following points of departure from *C. gunnii* are emphasized by Gray: stipe irregular, flexuose, much *more slender* (in some examples no thicker than a straw), *fulvous-woolly* on the buried portion (especially toward soil surface), springing from "various portions of the body of the caterpillar", the terminal club not nearly so thick or dark as in *C. gunnii*. None of these features *per se* (except the woolly investment) is of much significance in a highly polymorphic fruiting body like that of *C. gunnii*, but Gray's figures do portray a fungus with sharply determinate fertile apices.

The name *C. hawkesii* is here applied, not without some misgiving, to a population having bay- to coffee-brown, often dilated or contorted, sharply defined fertile clubs that are always wider than their stipes; this fungus may grow in company with, but remains distinct from, *C. gunnii*. The writer believes it to be conspecific with Olliff's *C. pieli* (*l.c.*)—a name which might have to be taken up, if the type of *C. hawkesii* can ever be found and referred to some other taxon. Perithecial mouths are comparatively much broader than in *C. gunnii*, almost touch each other and do *not* protrude, while the filiform sporidia do not readily break up into secondary spores, each of which is ± 2.5 mic. long (sporidia of *C. gunnii* soon separate into rectangular secondary spores $3-5 \times 2.5$ mic.—cf. $2.5-3 \times 2$ mic. given by Dingley, 1953). Both species have glabrous or, at most, only microscopically felted stipes—without a sign of the wooliness ascribed to *C. hawkesii* by its author. *C. cranstounii* and *C. robertsii* are more or less woolly about the lower parts of the stroma, in Victoria inhabiting the same host as *C. hawkesii*, but they differ from it in many other respects.

C. meneritidis F. Muell. & Berk. in *Gdnrs' Chron.* ser. 2, 10: 791, fig. 130 (1878)—ut "*C. menesteridis*" in err.

C. entomorrhiza (Fr.) Link var. "*menesteridis*" (F. Muell. & Berk.) Cooke *Handb. Aust. Fungi* 277 (1892);

C. gracilis sens. Lloyd *Synops. Cordyceps Australasia* 10 (1915), *non certe* Durieu & Montagne (1846);

? *C. gracilioides* Y. Kobayasi in *Sci. Rep. Tokyo Bunrika Daig.* (B) 84: 140-42 (1941)—TYPE (Herb. Kobayasi) on coleopterous larvæ at Mt. Takao-san, Musasi Prov., Japan (Y. Kobayasi, July, 1936).

Descriptio amplificata:

Stipes 2-5 cm. longus, 1-3 mm. crassus, paulum curvatus vel flexuosus, tenue farinaceo-squamulosus, superne pallidi-carneus, subter ochraceus. *Caput* fertile terminale, ellipsoideum, $5-10 \times 3-5$ mm., nitidulum, castaneo-fulvum (interne ochraceum), interdum geminatum. *Perithecia* omnino immersa, ad partem latissimam $0.6-0.8 \times 0.16-0.23$ mm. *Ostiola* minuta, atra, 60-80 mic. diam., 200-320 mic. disjuncta, ad apicem densiora. *Asci* longe cylindrici $200-450 \times 3-4$ mic., capitibus subglobosis $3-4$ mic. altis. *Articuli ascosporarum* $6-7 \times 1-1.5$ mic., quisque 3-septatus apparens. Status conidialis ignotus.

Host: Meneristes laticollis Boisd. & *Lepispilus* spp. (Coleoptera—Tenebrionidae).

Type: Mouth of Yarra River, Vic. (C. French, c. 1878—K, MEL).

Other Collections: Near Melbourne, Vic. (Miss J. Raff, June, 1908—MEL); Creswick, Vic. (J. H. Willis, Aug., 1929—MEL); Kalorama, Vic. (J. H. Willis, May, 1946—MEL); Boronia, Vic. (F. R. Fleet, Oct., 1953—MELM); Carrum, Vic. (C. Oke, Sept., 1930—MELU); "Southern Tablelands," N.S.W. (J.W.W., 1921—SYD); Mt. Nelson Range, ? near Hobart, Tas. (? L. Rodway, July, 1919—HO).

According to the joint authors (*l.c.*), type was found "on the caterpillar of *Menesteris laticollis* Boisd."—an obvious mistake for *Meneristes laticollis*, there being no insect genus "*Menesteris*". Thus it is permissible to correct the genitive spelling of the epithet, from "*menesteridis*" to *meneristitis*. Moreover, the host is a tenebrionid beetle larva, not a "caterpillar".

Cooke (*l.c.*) reduced *C. meneristitis* to a variety of the European *C. entomorrhiza*; but the latter has a filiform, toughly rigid stipe (not fleshy as in *meneristitis*), with blackish globoid capitulum (violet-coloured internally) and these two taxa are not closely allied at all. *C. meneristitis* has much more in common with *C. gracilis*—first described from Algeria, but ranging through Europe, China, the United States and Brazil—and C. G. Lloyd (Mar., 1915, pp. 10–11) merged it with this widespread species. *C. gracilis*, however, is a parasite on lepidopterous larvæ and the stipe is characteristically clothed near the base with *branched mycelial rhizoids* or fibres. Kobayasi (1941, p. 143) tabulates the differences between the related species *C. glaziovii* Henn. (from Brazil), *C. gracilis* Durieu & Montagne and *C. gracilioides* Kobayasi (*l.c.*, p. 140); under the last novelty, from Japan, he places as a doubtful synonym *C. meneristitis* ("*menesteridis*"), with the remark "sp. imperfecte cognita". But *C. meneristitis* is now no less well known in Victoria than most other species of *Cordyceps*, and there do not seem to be adequate grounds for recognizing *C. gracilioides* as distinct. Except in the longer wider asci (600–700 \times 6–6.5 mic.), Kobayasi's description fits the Victorian plant admirably, so his name is listed above as a synonym of *C. meneristitis*—with prefixing query, because the present writer has had no opportunity to compare actual types.

Should some future worker decide that *C. meneristitis* (despite its different host and consistently bare stipe) is not sufficiently distinct from *C. gracilis* to justify specific rank, then the latter, older name must prevail. Incidentally, Kobayasi's identification of the host in *C. gracilioides* (*l.c.*, p. 141) as "Larvæ of *Cossidæ* (Coleoptera)" is absurd, *Cossidæ* being a family of large wood moths (*Lepidoptera*) and having nothing to do with the *Coleoptera* (beetles).

C. militaris (Fr.) Link *Handb. Erkenn.* . . . *Gewächse* 3: 347 (1833).

Sphaeria militaris Fr. *Syst. Mycol.* 2: 323 (1823).

Host: Various genera of *Lepidoptera*, sometimes *Coleoptera* and even *Hymenoptera*.

Type: Apparently none.

Australian Collections: Apollo Bay, Vic. (F. J. Halsey, Sept., 1935—MELU; Miss M. Fawcett, Sept., 1937—MELU); Turton's Track, near Beech Forest, Vic. (May 1936—MELU).

Dr. Ethel I. McLennan, of the Botany School, Melbourne University, determined the three collections cited above (from Otway Ranges) as *C. militaris*—a variable fungus widespread through Europe, Asia and North America. Although these Victorian representatives have smaller-than-average stromata, they were correctly identified (in the writer's opinion). No other Australasian occurrence of *C. militaris* has been reported, but this orange-headed species is most likely to exist in other fern-gully habitats of south-eastern Australia (including Tasmania).

C. robertsii (Hook.) Berk. in Hook. f. *Flor. N.-Z.* 2: 202 (1855).
(Plate VII).

Sphaeria robertsii Hook. *Icon. Plant.* 1: t. 11 (1836);

S. huegelii Corda *Icon. Fungorum* 4: 44, t. 9 fig. 129 (1840)—TYPE (? PR) from New Zealand (Baron C. v. Hügel, 1834);

S. forbesii Berk. in *Lond. J. Bot.* 7: 578 (1848)—nomen nudum;

Clavaria larvarum Westwood in *Proc. ent. Soc. Lond.* 2: 6 (1836)—nomen nudum;

Cordyceps huegelii (Corda) Corda *Anleit. Stud. Mycol.* 207, t. F fig. 22 (1842);

C. larvarum Olliff in *Agric. Gaz. N.S.W.* 6: 410 (1895)—nomen superfl.;

C. selkirkii Olliff l.c. 411, t. 4 fig. B (1895)—TYPE (? SYDM, ? HO) "on caterpillars of *Pielus hyalinatus* Herr. Sch. and *Pielus* sp." at Kurrajong Heights, N.S.W. (*H. Selkirk*, early 1894).

Host: *Oxycanus* spp. and perhaps related genera (*Lepidoptera*—*Hepialidæ*).

Type: New Zealand, without precise locality (Mr. Roberts—? K).

Australian Collections:

New South Wales—Kurrajong Heights (? *H. Selkirk*—SYDM, HO, as *C. selkirkii* Olliff); "Hotel Australia", Eden (*Gabon*, Mar., 1908—NSW No. 927/08, barren and dubious specimen); Road between Fitzroy Falls and Nowra (*E. Cheel* & *J. B. Cleland*, June, 1919—NSW); National Park (*J. McLuckie* & *A. Burges*, June, 1932—SYD); Bola Creek, National Park (*A. Burges*, Mar., 1947—SYD); National Park (*C. M. Eardley* & *A. Burges*, Apr., 1947—ADW No. 269).

Queensland—Rain forest in Lamington National Park (*A. B. & J. W. Cribb*, May, 1955—Herb. A. B. Cribb, Brisbane, also MEL).

Victoria—Tyrendarra, near Portland ("Pres. Trng. College Educ. Dept.", June, 1912—MELM); Koroit (*R. T. M. Pescott*, Aug., 1932—MELU, barren specimen); Koonung Creek, Doncaster (Mr. & Mrs. *Paul Fisch*, June, 1942—MEL, MELU, ADW No. 3146); Rye (Mrs. *Paul Fisch*, Sept., 1956—MEL); Tarra Valley Nat. Park (Mrs. *K. Healey*, June, 1959—MEL).

Tasmania—? loc. (Dr. *Crivelli*—MEL); "Southern Tasmania" (? *L. Rodway*, Nov. 1914—HO); Mt. Wellington, 200 ft.

(? *L. Rodway*, Aug. 1924—HO); Cascades, Hobart (? *L. Rodway*, May, 1924—HO); Track to Lady Barron Falls, Mt. Field National Park (? *L. Rodway*, June, 1924—HO).

[Noted also at Willoughby (Sydney) and Rope's Creek in New South Wales; at Warrandyte, Wonga Park and Kalorama (Dandenong Ranges) in Victoria.]

Charles Robin (1853, pp. 655–660) devoted six pages to his description of *C. robertsii*, in French, giving a remarkably detailed account of its anatomy and furnishing a coloured illustration. The synonymy set out by Joan Dingley (1953, p. 331) is unfortunately marred by at least five errors in the quotation of literary references. As pointed out by her (*l.c.*, p. 332), Kobayasi erred in taking up the name *C. larvarum* (Westwood) Olliff, because its basionym *Clavaria larvarum* Westwood (1836) was a *nomen nudum*; but *Sphaeria robertsii* Hook. (1837) was validly published, with short description and unmistakable drawing, so the legitimate name must be *C. robertsii* (Hook.) Berk. in Hook. f.

The writer agrees with Kobayasi (1941, p. 99) and Dingley (*l.c.*) in reducing *C. huegelii* (Corda) Corda and *C. selkirkii* Olliff to synonymy under *C. robertsii*. Undivided stromata are the usual attribute of this species in New Zealand, but Australian populations are very frequently branched (the "*C. selkirkii*" form), and even the precise line of demarcation between *C. robertsii* and the usually much larger *C. taylori* sometimes appears hazy. Dingley (1953, p. 331) describes the perithecia of New Zealand collections as 0.4–0.5 mm. wide, whereas both Cunningham (1921, p. 378) and Kobayasi (1941, p. 102) give a measurement of 0.3–0.4 mm. The only two New Zealand specimens of *C. robertsii* in Melbourne Herbarium show the mature perithecia to be even narrower (0.15–0.2 mm.), just as in Australian examples; so the size of these receptacles would seem to be rather variable.

C. scottiana Berk, ex Olliff in *Agric. Gaz. N.S.W.* 6: 407, t. 1 (1895).

? *C. heteropoda* Y. Kobayasi in *Sci. Rep. Tokyo Bunrika Daig.* (B) 84: 144–47 (1941)—TYPE (Herb. Kobayasi) on *Tibicen bihamatus* Motschulsky at Toyohira-kyo, Isikari Prov., Japan (Y. Kobayasi, Aug., 1937).

Host: *Rhyssonotus nebulosus* Kirby (*Coleoptera*—Lucanidae), apparently also cicada larvæ (*Cicadidae*).

Type: Ash Island, Hunter River, N.S.W. (*A. W. Scott*, Sept., 1861—? *loc.*). ICONOTYPE (by Mrs. Helena Forde) reproduced with original diagnosis (*l.c.*).

Known only with certainty by the type (if still in existence), description and original coloured figure (*l.c.*), *C. scottiana* must be very close indeed to the true, boreal *C. gracilis* Durieu & Montagne; but it has much longer, yellowish-red mycelial strands at the base of stipe and inhabits a coleopterous (or hemipterous) not lepidopterous host. Lloyd (1920, p. 911) acclaimed it as "the only one of Mr. Olliff's species that appears good to us". Berkeley received specimens of what he proposed to call "*Sphaeria scottiana*" from Mr. Scott (the collector), but does not appear to have published any description of them; it is possible for this material to be among his other very numerous fungal specimens at Kew. In the Insect

Gallery of The Australian Museum at Sydney is a specimen labelled "*Cordyceps scottianus* Olliff. Cooma, N.S.W. Melolonthid grubs". But it has not been possible to ascertain whether this collection is really conspecific with the original Hunter River material or, which is more likely, represents some other *Cordyceps* (perhaps *C. meneristitis*—already known from the Southern Tablelands). Pending a search for fresh material in the type area, the benefit of the doubt is accorded this taxon, and it is admitted here as a "good" species with one possible (if unproven) synonym.

Kobayasi (1941, p. 144) established a new species, *C. heteropoda*, for Japanese material hitherto referred by Kawamura (1929) to the Australian *C. scottiana*, and he took pains to tabulate (p. 147) the differences between the two. Because Kobayasi had to rely on the inadequate description of *C. scottiana* his conclusions are questionable. A curious misinterpretation of terms is obvious in his comparison of the palisade cells (which form a periphery to each fertile capitulum). The words "coated with a layer or envelope of oblong cells", in the case of *C. scottiana*, were taken "*en bloc*" from Olliff's diagnosis; however, by "cells" the latter author was referring to perithecia and certainly *not* to the hyphal matrix in which these receptacles are embedded! The only significant difference between *C. scottiana* and *C. heteropoda* is the larval host—stag beetle in the former, cicada in the latter population—and that, *per se*, does not constitute a reliable basis for speciation.

C. taylori (Berk.) Sacc. *Michelia* 1: 320 (1878).

Sphaeria taylori Berk. in *Lond. J. Bot.* 2: 209, t. 8 fig. 2 (1843);

S. innominata R. Taylor in *Tasm. J. nat. Sci. Agric. Statist.* 1: 307–8, illust. (1842);

Cordyceps trictenæ Olliff in *Agric. Gaz. N.S.W.* 6: 410, t. 3 (1895);

C. henleyæ Massee in *Ann. Bot., Lond.* 9: 28, t. 1 fig. 1–12 (1895)—TYPE (K, MEL) on *Trictena* sp., Ovens River, Vic. (Miss M. Henley, 1893);

C. melbourniensis Lloyd *Mycol. Notes* 7⁵: 1353, fig. 3153 (1925)—nomen provis.

Host: *Trictena* spp. (Lepidoptera—Hepialidæ).

Type: *Murrumbidgee River, 10 miles from *Yass, N.S.W. (J. Allan, Mar., 1837—K).

Other Collections:

New South Wales—Queanbeyan (H. Selkirk, 1896—NSW No. 6895).

Victoria—Gerangamete, Otway Ranges (J. Davis, Nov., 1886 MELM; Carr, 1886—MEL; J. Price, July, 1886—MEL; H. Ireland, June, 1891—MEL); Apollo Bay (Mott, 1892—MEL; J. E. Syme, 1906—NSW No. 4095); Beech Forest (J. M. Reed, June, 1918—MELM; C. C. Brittlebank, 1926—SYD, as "*C. melbourniensis*"); Forrest (Sawmill Employees' Asscn., Sept., 1912—MELM); Cape Otway Ranges (1894—MEL); Cape Otway (SYDM Nos. A48, K100, K349); ? Caulfield (W. Kershaw, 1870—MELM); South Gippsland (per Editor "*Australasian*", June, 1892—MELM); Strzelecki Ranges (W. Johnstone, July, 1895—MEL); Snowy Creek, between Omeo and Tallangatta

* Spelt "Murrumbidgee" and "Yap" in the original diagnosis.

(Mrs. McCann, 1889—MEL); Ovens River (Miss M. Henley, 1893—MEL, duplicate type *C. henleyae* Masee); Harrietville (J. Gardner, June, 1933—MELU).

Without doubt, the first validly published description of this taxon was under the name *Sphaeria innominata*, by Rev. Robert Taylor (1842). His material came from the same suite of specimens (Murrumbidgee River, 1837) which furnished Berkeley with the type of *S. taylori*—published the following year, apparently in ignorance that Taylor himself had already described this fungus in an obscure colonial journal. There would seem to be a clear case for making the new combination, *Cordyceps innominata*; yet, one hesitates to do so in deference to Article 77 of the International Code of Botanical Nomenclature (Stockholm, 1950), which demands the rejection of any name or epithet "when it is based on a monstrosity". Now Taylor's figure of *Sphaeria innominata* portrays a stroma with numerous, tightly aggregated (cauliflower-like) and apparently sterile branches—quite atypical of the fructification (spreading, antler-like and sparingly branched) that one is accustomed to associate with the name *C. taylori*. Was the type specimen of *S. innominata* a "monstrosity"? The present writer believes it was, and, if so, we can conveniently reject this name.

But, is the type (preserved at Kew) of Berkeley's *S. taylori* any more normal? Among fungi, which are notoriously polymorphic, who is to decide whether any particular specimen satisfies the concept of a monstrosity or not?* The type figure of *S. taylori* also shows a densely branched, cauliflower-like stroma (without perithecia) and might well come under the category of a "monstrosity"—in which case Masee's later name *C. henleyae* (l.c.) would be applicable; but even *C. henleyae* does not typify the usual fructification of this parasite, being etiolated with long narrow branches. Lloyd (Mar., 1915, p. 8) remarked:

I am not satisfied that *C. taylori* is the same plant as our photograph. The type is preserved at Kew and it has 15–20 immature branches, resembling the head of a Medusa. There are several collections (as our figure) received at a later date, at Kew and the British Museum, and referred to this species. Not one of them had more than four primary branches, and are quite different in appearance to me from the original specimen.

Both of the forms mentioned by Lloyd have been found growing on the same large moth larva (*Trictena* sp.—probably *T. argentata*) in the Otway Ranges, Vic., where sporophores vary from simple or once-forked to intricately and much-branched structures. The present writer does not doubt that these represent one and the same species.

An interesting speculation arises: could all the populations of "*C. taylori*" be interpreted as merely a vigorous and obese development of *C. robertsii*, adapted to growth on a much larger host (*Trictena* instead of the usual *Oxycanus*)? The actual perithecial differences between these two entities are very slight, and the criteria for separating them seem rather artificial—viz., size, shape and degree of branching. E. Cheel, as reported by Lloyd (1920, p. 911), made the suggestion that *C. henleyae* was merely a branched condition of *C. robertsii*; but, from its robustness and choice of host (*Trictena*), the writer would certainly identify it with *C. taylori*. The fact that in Victoria one may find branched specimens of undoubted *C.*

* Regarding monstrous forms, see apposite remarks by C.G.G.J. van Steenis in *Flora Malesiana* 53: clxxi (May 1957).

robertsii on *Oxycanus* and unbranched examples of *C. taylori* on *Trictena*—perithecia being variable in both—indicates a strong affinity between the two. Yet, to sweep all the forms of robust *C. taylori* into the synonymy of slender *C. robertsii* would presuppose far more knowledge of these intriguing fungi (and their life-histories) than we possess. For the present, the writer prefers to retain the familiar name *C. taylori* (even if strictly illegitimate) and apply it to those massive, usually branched growths on *Trictena* in mountain country, leaving the solution of a major taxo-nomenclatural dilemma to abler investigators of the future.

As pointed out by Rodway (1920, p. 116), Olliff's *C. trictenæ* (l.c.) is simply an inadvertent re-description of type *C. taylori*, based upon the selfsame illustration that accompanied Berkeley's original account of *Sphaeria taylori* (1843). Lloyd's name "*C. melbourniensis*" (1925, p. 1353) is provisional and has no standing; it was suggested, as a comment, with the recording of a curious form of *C. taylori* collected by C. C. Brittlebank (presumably near Melbourne, but most probably from Beech Forest in the Otway Ranges).

C. sp. [aff. *C. entomorrhiza* (Dickson) Fr.].

Host: *Othnonius batesii* (Coleoptera—Scarabæidæ).

Locality: Graman, N.S.W. (T. V. Bourke, 1958, also May-June, 1959—MEL).

The single collection consists of a number of mummified cockchafer larvæ, each with several fructifications (1-4 cm. long) from various parts of the body integuments; two stipes carry mature spore-bearing capitula. In aspect, gross morphology, colouration, ascus and spore details, the material can hardly be distinguished from *C. aphodii* J. Mathieson; yet the more compact perithecia are definitely arranged at right-angles to the capitular axis, not obliquely as in that Victorian species. By this feature it approaches the European *C. entomorrhiza*—a much larger plant with blackish subglobose capitula about 6 mm. wide. One is tempted to query the reliability of perithecial orientation, as a primary feature in classifying *Cordyceps*, and to wonder whether *C. aphodii* and the undetermined fungus from Graman. (N.S.W.) may not, in fact, be forms of the same species.

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PLATE VII



Cordyceps robertsii (Hook.) Berk.

(Specimens from Koonung Creek, Doncaster, Vic., on larvæ of *Oxycanus diremptus*,
June, 1942)

—Photo. by courtesy H. T. REEVES.

PLATE VIII



Cordyceps cranstounii Olliff.

(Specimens from Koonung Creek, Doncaster, Vic., on larvæ of *Oxycanus diremptus*, June, 1942)

—Photo. by courtesy H. T. REEVES.

PLATE IX



Cordyceps gunnii (Berk.) Berk.—figs. 1–3;
? *C. hawkesii* (G. R. Gray) Cooke—figs. 4–6..

(Specimens from Koonung Creek, Doncaster, Vic., on larvæ of *Oxycanus diremptus*,
June, 1942)

—Photo. by courtesy H. T. REEVES.

ORTHOGRAPHY OF CERTAIN SPECIFIC EPITHETS

by

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Occasionally it becomes obvious that a mis-spelling of some name (not intended by its author or due to his ignorance) is being perpetuated. In the following four names of Australian plants, the specific epithets can be categorized as unintentional "typographic or orthographic errors" and their correction is allowed under Article 82 of the International Code of Botanical Nomenclature (Stockholm, 1950). In each instance, cogent reasons are advanced for emendation of the spelling now in use:

ASCOMYCETES.

HYPOCREACEÆ.

Cordyceps menesteridis F. Muell. & Berk. in *Gdnrs' Chron.* ser. 2, 10: 791, fig. 130 (1878).

M. J. Berkeley remarked (*l.c.*) "Baron Müller has lately sent us . . . from the banks of the Yarra near Melbourne, gathered by Mr. C. French on the caterpillar of *Menesteris laticollis* Boisd." There is no such insect genus as "*Menesteris*"; but a tenebrionid beetle called *Meneristes laticollis* Boisd. does occur in Victoria, and this is clearly the host species intended by Berkeley (who probably misconstrued a handwritten note sent to him by Baron von Mueller). Incidentally, the larva parasitized by this fungus is more likely referable to the widespread genus *Lepispilus* than to *Meneristes*. The specific epithet, however, should be corrected to read **meneristitis**.

A. S. Olliff (one-time Government Entomologist of New South Wales, who should have known better) also erroneously renders the spelling of the supposed host-insect as "*Menesteres laticollis*", in *Agric. Gaz. N.S.W.* 6: 407 (1895).

The spelling of *Isaria oncopterae* McAlpine (another entomogenous fungus in the family *Hypocreaceæ*) by its author in *Proc. roy. Soc. Vict.* n. ser. 7: 165 (1895) was deliberate and excusable; but the lepidopterous genus concerned is now spelt *Oncopera*—to conform with F. Walker's original rendering (1856)—and the name of its fungal parasite should be amended to read **Isaria oncoperae**. E. Meyrick [*Proc. Linn. Soc. N.S.W.* ser. 2, 4: 1124 (1890)] was not justified in changing *Oncopera* to "*Oncoptera*".

HEPATICÆ.

PORELLACEÆ.

Porella cranfordii Steph. in *Hedwigia* 28: 270 (1889).

Type of this Queensland and northern New South Wales hepatic was collected by one A. R. Crawford, who botanized in the New England district (N.S.W.), not by "Cranford"—as F. Stephani erroneously transcribed the proper name. This author later (1910) made the combination "*Madotheca cranfordii*", but the Linnean genus *Porella* has priority over *Madotheca* and must stand. Obviously the specific epithet should be corrected to **crawfordii**.

ANGIOSPERMÆ.

MYRTACEÆ.

Tristania lactiflua F. Muell. *Fragm. Phyt. Aust.* 1: 82 (1859).

In the original description of this North Australian tree, the author specifies "*petala alba*", and it is evident that his intention was to choose an epithet meaning "with milk-white flowers", not "milk-flowing"; apparently the substitution of "*u*" for the handwritten "*or*" of the manuscript was a mistake in type. Mueller himself amended the spelling to "*lactiflora*" in his *Syst. Census Aust. Plants* 1882, and so it also appears in the *Second Syst. Census* of 1889; but Bentham (1867) and Ewart (1917) both retained "*lactiflua*". The epithet should certainly appear as **lactiflora**.

GOODENIACEÆ.

Scaevola brookeana F. Muell. in *Vict. Nat.* 1: 122 (1884).

This West Australian shrub was named in honour of its discoverer, Miss Sarah T. C. Brooks, who died at Norseman Hospital in September, 1928; but Mueller invariably mis-spelt the surname as "Brooke". He later honoured the same lady in his description of *Hakea brookeana* (1886). C. A. Gardner in *Enumeratio Plantarum Australiæ Occidentalis*: 31 (1930) had already corrected the latter name, to read *H. brooksiana*, but he inconsistently retained *Scaevola "brookeana"* in the same work. This epithet should also be spelt **brooksiana**.

REDUCTION OF THE LICHEN GENUS BIBBYA J. H. Willis

In *The Victorian Naturalist* 73: 125 (1956) I erected a new genus of lichens, *Bibbya*, the single species of which was known to me only from three localities in the Victorian alps, all at or above 5,500 ft. (= 1700 m.)—viz. Bogong High Plains, Mts. Hotham and Stirling. This action was prompted by Dr. Carroll W. Dodge (St. Louis, Missouri) who received Bogong material from the late Mr. P. N. S. Bibby in 1953, pronounced it as representing an undescribed genus of the *Usneaceae*, and suggested that the latter botanist publish a diagnosis. Mr. Bibby did not live to follow up this suggestion, but I subsequently took pleasure in naming the genus after him.

More recently, Dr. Rolf Santesson (Keeper of the Herbarium, Botaniska Museet, Uppsala, Sweden) requested permission to examine some material of *Bibbya muelleri*, which I sent him. He found this to differ in no respect from the South American species *Toninia bullata*, specimens of which he had collected himself on Isla Navarino, Tierra del Fuego (at 20-50 m.) in 1940. Having inspected Dr. Santesson's collection, I agree that our Victorian lichen is identical, that the structure is not inconsistent with subfruticose members of *Toninia* (a genus of about 100 species in the family *Bacidiaceæ*) and that I erred in giving this Australian (and Andean) representative distinct generic rank. Following is the essential synonymy of *Toninia bullata*, which is now known from Peru (TYPE locality being Tacora, above 14,000 ft., on earth and amongst mosses), Patagonia, Tierra del Fuego, Juan Fernandez and north-eastern Victoria:

Toninia bullata (Meyen & Flotow) G. Zahlbr. in *Beih. bot. Zbl.* 19² (Heft 1): 76 (1905).

Lecidea bullata Meyen & Flotow in *Nova Acta Leop. Carol.* 19, Suppl. (Lichenes): 227 (1843);

Bibbys muelleri (F. R. M. Wilson) J. H. Willis in *Vict. Nat.* 73: 125 (1956);

Siphula muelleri F. R. M. Wilson in *Vict. Nat.* 6: 179 (1890).

—J. H. WILLIS.

NOTES ON THE VEGETATION OF EUCLA DISTRICT, W.A.

(with brief account of botanical collections represented in Melbourne Herbarium).

by

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Introductory.

Eucla is situated on the coast of the Great Australian Bight, about 8 miles west-south-west of the South Australian border (*viz.*, the 129th meridian of east longitude, which meets the sea at Wilson Bluff). Its sandy harbour was discovered about 1867 and, within the same year, surveyed and named "Port Eucla" by Captain Douglas (President of the South Australian Marine Board). The name is said to be a corruption of the aboriginal *Yirculyer* (or *yer-coloya*)—actually applied to a bluff (probably Wilson Bluff) near the present settlement which natives knew as *Chiniala*.

In *Wild Life* 10: 119 (Mar., 1948), P. Crosbie Morrison wrote thus of the place: "On the map it stands out, usually in fairly bold lettering, all by itself. It looks so lonely, and yet, somehow, so important." In the *Western Australian Year-book for 1894-'95*: 33 (1896), Malcolm A. C. Fraser listed Eucla in the section devoted to "Principal Towns", with the somewhat irrelevant description:

A small settlement on the eastern boundary of Western Australia, about 520 miles east of Esperance and about an equal distance west from Adelaide. . . . Population, 24 males, 8 females. There is a small jetty, a police station, and a Customs office. Camel teams from South Australia occasionally pass through.

By 1904 the population had risen to 60; it reached a peak in 1927-28, but Eucla declined completely after the multiplex telegraph channel along the transcontinental railway line was opened in 1929. The settlement at present consists of a single inhabited building—the "Hotel Eucla"—with one family, and a petrol station. This has become a principal refuelling and stopping place on the great Eyre Highway, and about 60 cars now pass by each day; it is also a focal point from which to visit the more spectacular limestone caves of the nearby Nullarbor Plain.

The Physical Environment.

That vast monotonous plateau of horizontally-bedded Miocene limestone, constituting Nullarbor Plain, reaches the ocean as a line of vertical cliffs from 200 to 400 feet high; but, for the 150 miles between Eyre and Eucla, this escarpment swings inland—to a maximum distance from the sea of about 27 miles (near Madura), leaving a flat coastal plain. The cliff-line, known as "Hampton Range" and "Bunda Scarp", doubtless marks the position of a former shore-line. Various authorities, e.g., H. P. Woodward (1890) and J. T. Jutson (1934), have associated the cliffs with a fault scarp; however, the present spindle-shaped coastal plain (from Eyre to Eucla) probably owes its origin to a post-Tertiary, slight eustatic change in sea-level—it is largely covered with sand-dunes, both consolidated and mobile, interspersed with extensive saline flats. Eucla, situated at the very narrow eastern extremity of the littoral plain and close to the limestone escarpment, is remarkable for its high, moving dunes which have already obliterated several of the old telegraph station buildings and may eventually overwhelm the whole settlement.

The annual rainfall at Eucla (based on mean monthly precipitation over a period of 60 years) is almost exactly 10 inches (*cf.* 11·7 inches at Eyre 150 miles westward); streams are lacking, and no fresh water is to be found at the surface throughout the thousands of square miles covered by the Nullarbor region.

Temperature records (over a period of 60 years) indicate a mean yearly maximum of 72·7° F. and mean minimum of 53·7° F., with frequent very high temperatures during summer. Figures for relative humidity are remarkably uniform throughout the year, averaging 60.

Vegetation.

On the coastal plain three formations predominate—(1) MALLEE (with associations of *Eucalyptus oleosa*, *E. incrassata*—*E. gracilis*, umbrageous *Acacia sowdenii*, and *Melaleuca pubescens* toward the cliffs); (2) SALTBUSH (an alliance of *Arthrocnemum* and *Salicornia* species, with such smaller halophytes as *Hemichroa diandra* and *Wilsonia backhousei* on intermittently damp saline flats); and (3) the "NITRARIETUM" on moving dunes (immense isolated clumps of *Nitraria schoberi*) which passes into a narrow zone of littoral plants along the ocean beach. The strictly littoral flora includes a number of plants (often succulent) having an extremely wide range around temperate Australia—notably *Atriplex cinerea*, *Zygophyllum billardieri*, *Scaevola calendulacea* and *Olearia axillaris*. The *Arthrocnemum* (or "samphire") community, chiefly of *A. halocnemoides* and *A. leiostachyum*, occupies a large area of coastal plain—probably as great as that of any other ecological unit thereon.

The Mallee formation extends all along Hampton Range scarp itself, and for a short distance inland, dominated by *Eucalyptus oleosa* in varying association with other small, often bushy trees (*Melaleuca pubescens*, *Myoporum platycarpum*, *Acacia sowdenii*, *A. oswaldii*, *Exocarpos aphyllus*,

Santalum acuminatum, &c.) and such taller shrubs as *Heterodendron oleifolium*, *Pittosporum phillyreoides*, *Geijera linearifolia*, *Melaleuca quadrifaria* and *Eremophila alternifolia*. There is also a diversity of small shrubs fringing the limestone cliffs, e.g., *Rhagodia preissii*, *Templetonia battii*, *Pomaderris forrestiana*, *Westringia rigida*, *Eremophila scoparia*, *E. weldii*, *E. glabra*, *Olearia exiguiifolia*, *O. muelleri* and *O. magniflora*. Ephemeral herbs of the *Cruciferae* and *Compositae* abound in season.

As one progresses north from the scarp, arboreal growth immediately thins out and soon ceases, giving place to a Saltbush ("shrub-steppe") formation which stretches, unrelieved to the horizon, over a remarkably level surface. *Chenopodiaceae* is by far the largest plant family among perennials on this featureless plateau, both by number of species and area occupied, the most frequent members near Eucla being *Atriplex nummularia*, *A. hymenotheca* (syn. *A. vesicaria*), *Bassia uniflora*, *Kochia erioclada*, *K. sedifolia*, *K. oppositifolia*, *K. tomentosa* and *Enchylana tomentosa*—all species of very wide distribution in the Commonwealth. Grasses are also conspicuous, belonging chiefly to the genera *Danthonia* and *Stipa*. The lichen flora of the great saltbush region north of Eucla, although calciphilous and highly drought-resisting, is varied; but it has neither been collected nor studied adequately. Frequent among the larger terrestrial species are *Urceolaria scruposa*, *Psora decipiens*, *Lecanora sphaerospora* (and several other unidentified species), *Parmelia australiensis*, *P. semiviridis* (syn. *P. hypoxantha*), *P. versicolor*, *Caloplaca fulgens* var. *bracteatum* and *Buellia subalbula*.

The numerous sink-holes, caverns and "dongas" (larger, shallower areas of subsidence on the limestone), which are scattered over the Nullarbor Plain, afford some protection from wind. Under the moister conditions prevailing at these favourable spots, a number of thinner-leaved and more tender plants is able to thrive; here one may find several kinds of moss, the fern *Pleurosorus rutifolius*, sundry grasses, *Parietaria debilis*, *Lavatera plebeja*, *Nicotiana goodspeedii*, *Solanum nigrum* and *Galium gaudichaudii*. On dongas more remote from the coast, the Sturt Desert Pea (*Clianthus formosus*) becomes a landscape feature.

A few perennials are wholly or largely confined to the vicinity of Hampton Range, notably *Templetonia battii* and *Olearia exiguiifolia*—both known only from the limestone region between Fowler's Bay (S.A.) and Eyre (W.A.), with Eucla as the centre of development. *Pomaderris forrestiana* and *Frankenia densa* range from Eucla as far west as Widgiemooltha (near Norseman) and Israelite Bay respectively. *Melaleuca quadrifaria* occurs at Eucla pass (on the limestone escarpment) and also on the Fraser Range (W.A.), but is unknown elsewhere. A surprising occurrence at Madura pass, and the only record for Western Australia, is that of the cane-like grass *Stipa breviglumis*, otherwise known only from the Flinders and Mt. Lofty Ranges in South Australia and from a few dry rocky places in central-western Victoria; the name is incorrectly rendered "*S. breviculmis*" by Willis in *Mem. nat. Mus., Melb.* 15: 50 (1951).

Explorers and Plant Collectors.

The first white man to venture into the district was Edward John Eyrc, who came abreast of Eucla early in March, 1841, while making his epic journey westward on foot along the shores of the Bight; but the very nature of this extraordinary feat precluded any collecting of plant or animal life.

Captain E. Alfred Delisser [the name is variously spelt Delisser, "Delissier" and "Delessier" in John Forrest's *Explorations in Australia*, 1875] was a squatter and surveyor in search of good grazing land. In July, 1861, and again in June, 1865, he made excursions from Fowler's Bay (S.A.) onto the limestone plateau north of Eucla, coining for it the apt sobriquet "Nullarbor"—from the Latin *nulla arbor* (no tree)—and reporting favourably on its pastoral potentialities. Delisser's few botanical specimens found their way to F. Mueller and are now in Melbourne Herbarium, with the label "far to the N.W. from the head of the Great Bight" (e.g., *Rhagodia crassifolia*, *Kochia tomentosa*, *Atriplex hymenotheca* and *Threlkeldia diffusa*, *Eremophila alternifolia*, *E. scoparia* and type of *E. delisseri*, *Cephalopterum drummondii*).

Next came surveyor-explorer John Forrest (later Sir John, C.M.G.) who stayed at Eucla for twelve days in July, 1870, during the historical trip from Perth to Adelaide on horseback, with party of five. Forrest was reprovisioned by ship at Eucla, where he gathered at least 22 botanical specimens. The entire collection of the expedition was immediately dispatched to F. Mueller who described *Eremophila weldii* (from Point Dover and Eucla) as early as December, 1870. On the same page (109) of the *Fragmenta Phytographiæ Australiæ* vol. 7 (1870) Mueller gave a list of Forrest's plants "*e vicinia portus Eucla*"—apparently the first published catalogue of the district's flora.

Explorer Ernest Giles visited the same seaport in March, 1875, but it is not known whether he too collected samples of its flora (no specimens are ascribed to him in volumes 9–12 of Mueller's *Fragmenta*). Police-trooper Thomas Richards (of the Fowler's Bay district, S.A.) made several trips toward Eucla between 1875 and 1877, and his plant collectings also came to F. Mueller at Melbourne.

The overland telegraph line reached Eucla from Adelaide in July, 1877, and from Perth in December, 1877. Thereafter, the story of botanical exploration in this district very largely revolves around Eucla telegraph station. John David Batt, a telegraph linesman and keen walker, inhabited the district for at least a decade (1886–1896). His very extensive contribution of plants to Baron von Mueller, during those years, amounted to far more than all other Eucla collections combined. Represented among the many specimens were several new species (notably *Templetonia battii*, *Melaleuca quadrifaria*, *Brachycome tatei* and *Eremophila battii*). He collected also the type material of *Eriostemon gibbosus* and *Helipterum battii*—both from the Norseman district.

William Webb succeeded George Maxwell (who died in December, 1879) as Mueller's botanical collector in the Albany district, W.A. He touched at several remote parts of the south-east coast, and in 1893 transmitted material from as far away as Eucla settlement.

Between 17th June and 13th September, 1896, A. Mason (a Government official) examined a large tract of the Nullarbor lying between Kurnalpi and Eucla; he claimed to have discovered "some millions of acres of some of the finest pastoral and agricultural country in the world", but also reported on the very poor water resources. Apparently no plants were gathered for preservation, or, if so, their present whereabouts is not known. F. W. Beere sent several annotated specimens from Eucla to Melbourne Herbarium in July, 1896.

During quite recent years J. H. Willis and D. S. Kemsley have collected in the neighbourhood of Eucla. The former botanist spent two days between the Head of the Bight and Madura cliffs (a lineal distance of about 250 miles), while travelling with the Russell Grimwade Expedition in August, 1947; specimens of some 30 species of vascular plants were taken on that occasion. Kemsley worked over the same area, and well inland also, spending the whole month of January, 1952, with the Nullarbor Caves Expedition; he returned for a shorter period of cave-exploring in December of the same year, and his collections amount to some 70 species of vasculares and 20 of mosses.* All these collections have been added to the older exsiccatae already in Melbourne.

H. B. S. Womersley (Feb., 1954) obtained a suite of algal specimens from Wilson Bluff, on the State boundary east of Eucla; these are now housed in the Adelaide University Herbarium.

In view of the isolation and undoubted botanical interest attaching to Eucla district, remarkably little has ever been published, and there is still no comprehensive account of the flora. It is hoped that the foregoing remarks will focus attention on this need, and following is a list of the Eucla collectors whose contributions are preserved in the National Herbarium of Victoria, Melbourne:

List of Collections (in MEL), chronologically arranged.

- | | |
|---|-----------------------------------|
| Delisser, E. A.—July, 1861; June, 1865. | Batt, J. D.—1886–96. |
| Forrest, J.—July, 1870. | Webb, W.—1893. |
| Richards, T.—1875–77. | Beere, F. W.—July, 1896. |
| Carey, H. S.—1877. | Ryan, C. O. (Mrs.)—1895–96. |
| Oliver, J.—1881–84. | Willis, J. H.—Aug., 1947. |
| Turner, G. R.—1885. | Kemsley, D. S.—Jan. & Dec., 1952. |

References.

- MUELLER, F. J. H.—*Fragmenta Phytographiæ Australiae* 7: 109 (Dec., 1870).
 MORRISON, P. C.—"We went west (Eucla to Cocklebidly)" in *Wild Life* 10: 119–122 (Mar., 1948), with landscape photos.
 WILLIS, J. H.—"Botany of the Russell Grimwade Expedition" in *Memoirs of the National Museum, Melbourne* 15: 34–37 (Mar., 1951).
 KEMSLEY, D. S.—"The mysterious Nullarbor Plain" in *Walkabout* 24: 17 (Nov., 1957).
 ANON.—*Australian Encyclopædia* 3: 411 (1958).

* A special report will be published on the distribution of moss species throughout the Nullarbor region.

PLANTS OF THE RECHERCHE ARCHIPELAGO, W.A.

(some adjustments to published records, and a list of the species collected there by Robert Brown).

by

J. H. WILLIS,

National Herbarium of Victoria.

As Part 3a of the *Australian Geographical Society Reports* No. 1 (1953)*, I published an account of the land flora on the islands comprising the Archipelago of the Recherche. Critical examinations in the interim, including study of certain groups by specialists, have revealed the need for some changes affecting both identities and nomenclature. These amendments are set out here under the appropriate plant families, with explanatory notes, and I am grateful to Mrs. Rica Erickson of Bolgart (W.A.) for checking the seven *Stylidium* species, three of which had been mis-determined.

On page 4 of my account, reference was made to the visits of Robert Brown in January, 1802, and May, 1803, and the 29 species known to have been collected by that eminent botanist were indicated in the enumeration (pp. 23-30). It had been assumed that Brown collected no specimens on the latter occasion. In 1955, through the courtesy of Miss Nancy T. Burbidge (Division of Plant Industry, C.S.I.R.O., Canberra), I was enabled to peruse a typewritten index to Brown's unpublished botanical descriptions. In addition to the 29 species already recorded as from Middle Island in the Recherche Archipelago, 19 others in Brown's ms. descriptions bear the locality "Bay 2", "Goose Id. Bay" or "Large Island in Goose Id. Bay" (an obvious, if circumlocutory, allusion to Middle Island itself). Eight species are definitely dated May, 1803, proving that Brown *did* land and collect a few specimens on his second, late-autumnal visit to Middle Island. In the appended list I include all 48 Brownian collections, and have indicated the seven which are prerepresented by duplicate material in the National Herbarium at Melbourne; eight of these species were not re-discovered during our Australian Geographical Society's expedition of November, 1950, while three (*Gyrostemon sheathii*, *Alyogyne hakeifolia* and *Hibbertia cuneiformis*), which I had collected on the nearby mainland coast, are now presented as new records to the Archipelago.

Also, on p. 4 of the writer's previous article, it was suggested that Allan Cunningham may have collected at Middle Island in January, 1818, but conclusive evidence was not then available. Among a recent donation of early Australian collections received by Melbourne Herbarium from the British Museum (Natural History) are sheets of *Muehlenbeckia adpressa* (Labill.) Meissn., *Rhagodia baccata* (Labill.) Moq. and *Pimelea clavata* Labill., bearing Cunningham's numbers 14, 15 and 12 respectively, all with the caption:

"Middle Island, Recherche Archipelago. 1st Voyage 'Mermaid' 1818."

* For review, see *Vict. Nat.* 70: 109 (Oct. 1953).

In Ida Lee's *Early Explorers in Australia*, p. 312 (1925), is a transcription from Cunningham's journal entry of Friday, 16th January, 1818. This important entry proves that Cunningham landed and spent about an hour before dusk, observing "the botany of the sandy shores of the island" [i.e., the beach and dune vegetation along Goose Island Bay]. He mentions ten species of plants that were collected then, including the *Muehlenbeckia*—viz., "*Polygonum* sp., leaves cordate, undulately curved, three-nerved, stem fruticose, twining, flowers axillary." Presumably these items are still preserved in the herbarium, Royal Botanic Gardens at Kew.

AMENDMENT TO ENUMERATION OF 1953.

Ferns and Fern Allies

ISOETACEÆ

- P. 23—For *Isoëtes drummondii* A. Br. (*forma*), read *I. humilior* F. Muell., 1852.

[The rootstock is bilobed and each sporangium veiled by an indusium.]

Flowering Plants

GRAMINEÆ

- P. 23—For **Scleropoa rigida* (L.) Griseb, read **Catapodium rigidum* (L.) Hubbard in Dony, 1953.

[A very recent generic change.]

- P. 23—For *Serrafalcus arenarius* (Labill.) C. A. Gardner, read *Bromus arenarius* Labill., 1804.

[A reversion to the original name, owing to present revised concept of the genus *Bromus* (*sensu stricto*).]

For AIZOACEÆ (p. 25), read FICOIDACEÆ [the prior and legitimate family name].

CRASSULACEÆ

- P. 26—For *Crassula bonariensis* (DC.) Cambess, read *C. purpurata* (Hook. f.) Domin, 1925.

[Dr. R. Melville, at the Kew Herbarium (23/3/1956) kindly made comparisons of the Australian plant with typical South American *C. bonariensis*; he found that the former is specifically distinct in its sharply acuminate leaves, rather smaller flowers and different proportion of floral parts.]

MYRTACEÆ

- P. 28—From *Kunzea sericea* (Labill.) Turcz., delete the parenthetic authority "(Labill.)".

[The name of this plant is not, as stated by Bentham in *Flora Aust.* 3: 117 (1866), based upon *Leptospermum sericeum* Labill. which is a true species of *Leptospermum*—endemic and widespread in Tasmania.]

RUBIACEÆ

- P. 29—For *Galium australe* DC., read **G. tenerum* Schleicher, 1821.

[A mis-determination by the writer in 1953; the Recherche Archipelago material shows 5 leaves per whorl, not 4 as in the very similar-looking but less-petiolate indigenous *G. australe*.]

LOBELIACEÆ

- P. 29—For *Lobelia anceps* Thunb., read *L. alata* Labill., 1804.

[In E. Wimmer's monograph on *Lobeliaceæ* (*Pflanzenr.* 107 Heft, 1953) the Australian population is distinguished specifically from *L. anceps* of Africa.]

STYLIDIACEÆ

- P. 30—For *Stylidium pubigerum* Sond. in Lehm., read *S. corymbosum* R. Br., 1810.

[A mis-determination by the writer in 1953.]

- P. 30—For *Stylidium perpusillum* Hook. f. in Hook., read *S. calcaratum* R. Br., 1810 (a diminutive form).

[A mis-determination of Mondrain and North Twin Peaks material by the writer in 1953; but G. Maxwell's recorded collection purporting to be *S. perpusillum* (from Middle Island, 1863) is not represented in Melbourne Herbarium, and I can express no opinion as to its correct identity.]

- P. 30—For *Stylidium despectum* R. Br., read *S. brachyphyllum* Sond. in Lehm., 1845.

[A mis-determination by the writer in 1953; but these minute plants are very similar, often grow together and were confused by Ewart, Gardner and other Australian botanists. *S. despectum* has the petals paired longitudinally ("fore-and-aft") and lacks a rosette of basal leaves, while *S. brachyphyllum* is distinctly rosulate and has laterally-paired petals.]

COMPOSITÆ

- P. 30—For *Brachycome pusilla* Steetz in Lehm. (var.), read *B. eyrensis* G. L. Davis, 1955.

[Recently recognized as a distinct species and typified by the Figure-of-eight Island material—in *Proc. Linn. Soc. N.S.W.* 79: 207 (Jan. 1955).]

Mosses

POTTIACEÆ

- P. 32—From *Tortula princeps* De Not., delete the Middle Island record ("small form on moonah bark").

[This collection is referable to another, related species of the genus, viz. *T. papillosa* Wils. ex Spruce in Hook, 1845, which should now be added to the bryophyte flora of the Archipelago.]

Fungi

THELEPHORACEÆ

- P. 33—For *Corticium calceum* Fr., read *Sebacina* sp. (in the family *Tremellaceæ*).

[A mis-determination by the writer in 1953.]

ROBERT BROWN'S 48 SPECIES FROM MIDDLE ISLAND

Conifers

CUPRESSACEÆ

- Callitris preissii* Miq. in Lehm., 1845 [TYPE of *C. tuberculata* R. Br. ex Baker & Smith, 1910].

Flowering Plants

CENTROLEPIDACEÆ

- Centrolepis strigosa* (R. Br.) Roem. & Schult., 1817.

PROTEACEÆ

- Hakea clavata* Labill., 1804.

- Hakea suaveolens* R. Br., 1811 [? TYPE].

LORANTHACEÆ

- Amyema miraculosa* (Miq.) van Tiegh., 1895, var. *melaleuca* (Tate) Willis, 1953 [leg. May, 1803, and bearing the name "*Loranthus melaleuca*" in Brown's ms.].

CHENOPODIACEÆ

- Rhagodia baccata* (Labill.) Moq., 1849.
Rhagodia crassifolia R. Br., 1810 [? TYPE in part].
Suaeda maritima (L.) Dum., 1827 [incl. *S. australis* (R. Br.) Moq.]—not observed in 1950.

PIIYTOLACCACEÆ

- ? *Gyrostemon sheathii* W. V. Fitzg., 1903 [in Brown's ms. as "*G. crassifolium*", but presumably referable to *G. sheathii* which still occurs at Esperance]—a new record for the Archipelago, and not observed in 1950.

MIMOSACEÆ

- Acacia nitidula* Benth., 1864 [TYPE in part].
Acacia obscura DC., 1829.
"Mimosa amabilis" [leg. May, 1803]—identity uncertain.
Albizzia lophantha Benth., 1844.

PAPILIONACEÆ

- Bossiaea dentata* (R. Br. ex Ait.) Benth. [TYPE in part, duplicate material being in Melbourne Herbarium].

RUTACEÆ

- Phelialium rude* Bartl. in Lehm., 1844 [in Brown's ms. as "*P. obcordatum*", duplicate material being in the Melbourne Herbarium].

ZYGOPHYLLACEÆ

- Nitraria schoberi* L., 1759 [in Brown's ms. as "*N. australis*"].
Zygophyllum billardieri DC., 1824 [in Brown's ms. as "*Zygophylloides*"].

EUPHORBIACEÆ

- Phyllanthus* ? *calycinus* Labill., 1806 [leg. May, 1803, and bearing the name "*P. inflexus*" in Brown's ms.].

STACKHOUSIACEÆ

- Stackhousia huegelii* Endl., 1837 [in Brown's ms. as "*S. glauca*"].

SAPINDACEÆ

- Dodonaea oblongifolia* Link., 1821 [duplicate material of Brown's in Melbourne Herbarium, labelled "*D. ceratocarpa* Endl."].

RHAMNACEÆ

- Pomaderris myrtilloides* Fenzl. in Endl. & al., 1837.
Spyridium globulosum (Labill.) Benth., 1863 [leg. May, 1803, and bearing the name "*Cyauothoides obovata*" in Brown's ms.].

MALVACEÆ

- Hibiscus huegelii* Endl., 1837.
Alyogyne hakeifolia (Giord.) Alef., 1863 [leg. May, 1803, and bearing the name "*Hibiscus filifolius*" in Brown's ms.]—a new record for the Archipelago, and not observed in 1950.

DILLENIACEÆ

- Hibbertia cuueiformis* (Labill.) Gilg., 1893—a new record for the Archipelago, and not observed in 1950.

FRANKENIACEÆ

- Frankenia tetrapetala* Labill., 1804 [in Brown's ms. as "*Frankenoides tetrandra*"].

THYMELÆACEÆ

- Pimelea argentea* R. Br., 1810 [TYPE].
Pimelea clavata Labill., 1804.

MYRTACEÆ

- Eucalyptus platypus* Hook., 1852, var. *heterophylla* Blakely, 1934.
Agonis marginata (Labill.) Schau. in Lehm., 1844.
 ? *Kunzea baxteri* (Klotzsch) Schau. in Lehm., 1844 [*leg.* May, 1803, and bearing the name "*Metrosideros quinquelocularis*" in Brown's ms.].
Melaleuca pubescens Schau. in Walp., 1843 [in Brown's ms. as "*M. albiflora*"].
Astartea fascicularis (Labill.) DC., 1828.

EPACRIDACEÆ

- Leucopogon interruptus* R. Br., 1810 [TYPE, represented by a duplicate in Melbourne Herbarium].
Leucopogon rotundifolius R. Br., 1810 [TYPE in part; a Lucky Bay syntype in Melbourne Herbarium].
Leucopogon apiculatus R. Br., 1810 [TYPE in part; a Lucky Bay syntype in Melbourne Herbarium].

PRIMULACEÆ

- Samolus repens* (Forst.) Pers., 1805 [in Brown's ms. as "*S. pusillus*", duplicate material being in Melbourne Herbarium].

GENTIANACEÆ

- Villarsia parnassifolia* (Labill.) R. Br., 1810—not observed in 1950.

APOCYNACEÆ

- Alyxia buxifolia* R. Br., 1810 [TYPE in part].

SOLANACEÆ

- Solanum simile* F. Muell., 1854 [*leg.* May, 1803, and in Brown's ms. as "*S. laciniatum* var."; duplicate material of the collection in Melbourne Herbarium].
Anthocercis viscosa R. Br., 1810 [? TYPE in part].
Anthocercis littorea Labill., 1806—not observed in 1950.

MYOPORACEÆ

- Myoporum parvifolium* R. Br., 1810 [? TYPE in part]—not observed in 1950.

LOBELIACEÆ

- Lobelia* ? *alata* Labill. 1804 [in Brown's ms. as "*L. pulchella*"].
Isotoma scapigera (R. Br.) G. Don, 1834.

GOODENIACEÆ

- Scævola æmula* R. Br., 1810 [*leg.* May, 1803. TYPE of *S. sinuata* R. Br., now regarded as a synonym of *S. æmula*; duplicate material of Brown's in Melbourne Herbarium].

STYLIDIACEÆ

- Stylidium adnatum* R. Br., 1810 [TYPE in part].

COMPOSITÆ

- Olearia axillaris* (DC.) F. Muell., 1865.
Calocephalus brownii (Cass.) F. Muell., 1859.

NEW SPECIES AND VARIETIES OF PTILOTUS R.Br.
(AMARANTHACEÆ)

by

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1. *P. APPENDICULATUS* G. Benl, *species nova*. [Fig. 1.]

Planta lanuginosa—pilis dendroideis—caule uno erecto, semper villosa ad 50 cm alto, basi lignosa 4 mm crasso, per totam longitudinem foliato, ramoso; ramis ad 15 cm longis, basalibus (ad 7) 6–15 mm distantibus adscendentibus, mono- vel pleiostachyis. Folia alterna interdum secunda, inferne 1 cm, apicem versus 5 mm distantia, basalia longe (1,2 cm), caulina breviter petiolata; laminis ellipticis vel ovato-lanceolatis ad 6 cm longis, 1,8 cm latis, primo crassiusculis, albido-, dein cinereo-tomentosis, demum subglabrescentibus, margine undulatis, apice (1,5 mm) spinuloso-acuminatis; axillis lanatis.

Inflorescentiæ subcapitatae, spicis hemisphaericis 2,5 cm diam., raro terminalibus, saepius ad 12 pedunculatis (pedunculis 2–5 cm longis \pm foliatis) racemosis; rhachi brevi villosa.

Flores (15–30) straminei appendiculis lucidis tepalorum insignes. Bracteæ et bracteolæ hyalinae nitentes, costatae, acuminatae, inæquales: bractea fusciscente, oblonga vel subcordato-orbiculari ad 6 mm longa et 5 mm lata, dorso pilosiuscula; 2 bracteolis ellipticis vel obovatis ad 8 mm longis et 5 mm latis, \pm incoloratis, in nervo medio vix pilosis.

Tepala 5 linearia, apice nuda appendicem rhombeo-spathulatam formantia, basi trinervia valde indurata ad tubum cylindraceum extus hirsutum, ca. 2,5 mm longum coalita, extus pilis brevibus (inferne 3 mm, superne 1 mm longis), denticulato-nodosis, haud numerosis induta, inæqualia: 2 exteriora 1,3 cm longa, 1 mm lata, appendice ad 2,5 mm longa et 2 mm lata, intus glabra; 3 interiora \pm carinata 1,1 cm longa, 0,7 mm lata, appendice 1,5 mm longa et 1 mm lata, intus basim versus pilis lanatis obsessa.

Stamina 5 inæqualia, sæpe 3–4 abortiva, basi dilatata in tubum membranaceum, 2,5 mm longum, dimidio inferiore tubo perianthii arcte adnatum, anulo integro (1,2 mm alto) coronatum coalita; filamentis fertilibus subulatis 5 mm longis, basi 0,5–0,7 mm latis, anantheris ligulatis, \pm acuminatis 2–3 mm longis, ad 1 mm latis; antheris ellipticis ca. 0,8 mm longis.

Ovarium subclavatum longe stipitatum, 4 mm longum (stipite 2 mm incluso), 1,2 mm latum, apice parce pilosum—pilis ad nodos denticulatis, 0,4 mm longis; stylo excentrico, 4 mm longo, apice \pm curvato, stigmate minimo.

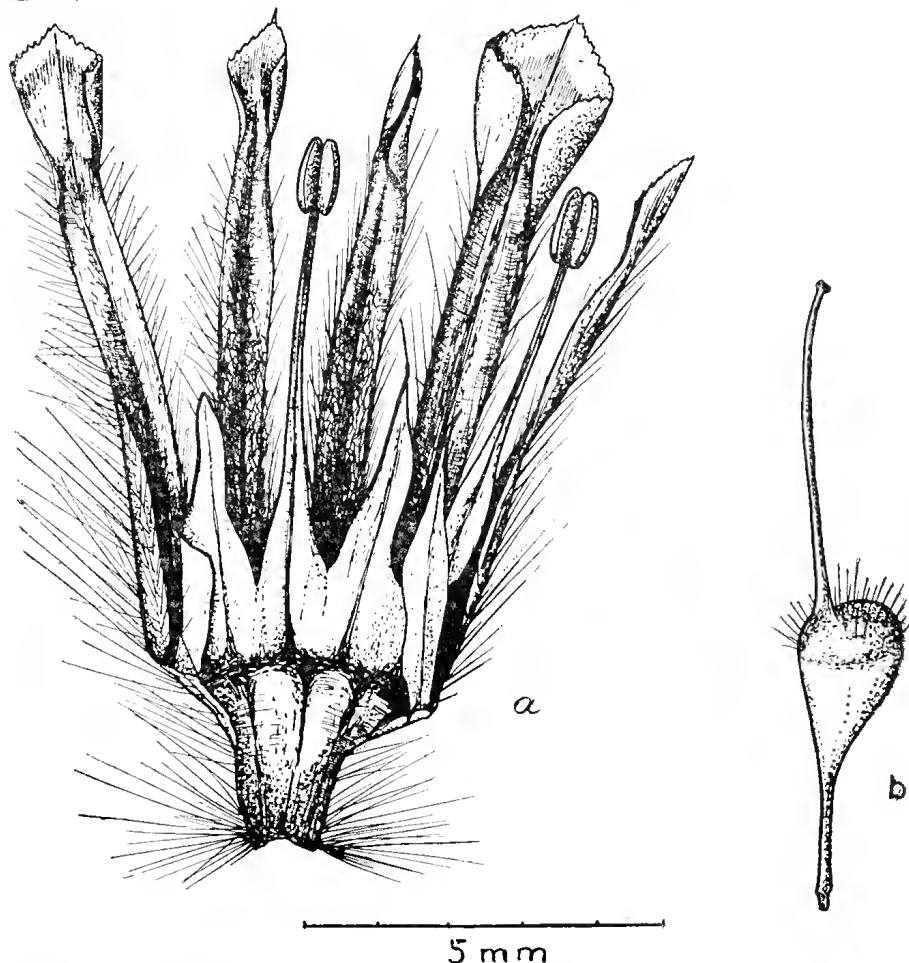


Fig. 1.—*Ptilotus appendiculatus* G. Benl. (a) Perianth with staminal cup spread open, inner view; (b) pistil.

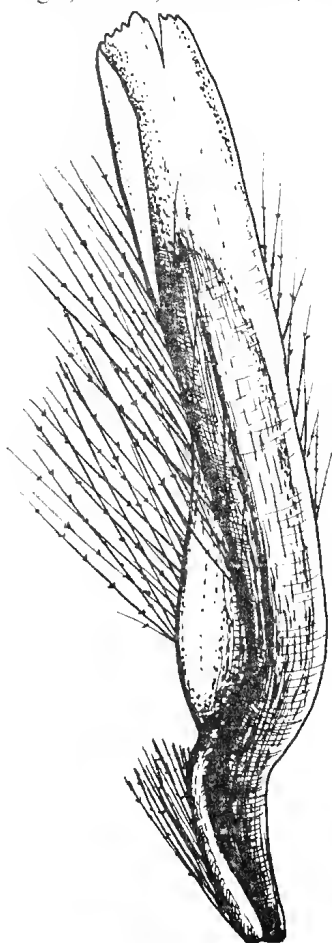
Representative localities: WESTERN AUSTRALIA—Globe Hill Station, Ashburton River (HOLOTYPE in K, ISOTYPE in E—*A. Morrison*, 6 Oct., 1905, No. 15098); Yule River and Fortescue River (in MEL—*A. Forrest*, 1878).

The plant approaches *P. fasciculatus* W. V. Fitzg. as to the size and form of the spikes, but differs markedly in the habit of the foliage. The general appearance of the new species somewhat resembles that of *P. axillaris* (F. Muell. ex Benth.) F. Muell., where, however, the leaves are glabrous, and many details of the flowers diverge. At first sight *P. appendiculatus* is recognizable by its conspicuous appendage-like extremities of the perianth-segments, together with the pubescence of the stem, the branches and leaves.

2. *P. CARINATUS* G. Benl, in *Mitteilungen der Botanischen Staatssammlung München*, Heft 14–15, 1956. [Fig. 2.]

Descriptio prima ad verbum iterata:

Planta erecta, caule (>3 mm diam.) foliato, angulato-striato, sublævi, inflorescentiam versus tomentosiusculo, corymboso-ramoso; ramulis summis mono- vel pleiostachyis. Folia caulina, alterna breviter petiolata, laminis (ca. 3,5 cm longis, 1,2 cm latis) primo sparse pilosis, dein glabrescentibus, oblongo-lanceolatis, acuminatis, integerrimis, in petiolum (0,5 cm) alatum angustatis; superiora reducta (0,5–0,7 cm longa) squamiformia. Spicæ solitariae vel compositæ, pedunculatæ vel raro sessiles, terminales vel laterales, in paniculam congestæ, ovato-hemisphæricæ vel oblongo-ovoideæ, 1–2,5 cm longæ, ad 1,5 cm latæ; rhachi lanuginosa.



2 mm

Fig. 2.—*Ptilotus carinatus* G. Benl.
Outer perianth-segment, side view.

Flores subdensi visu rosei, albido-pilosi (pilis denticulato-nodosi); bracteis bracteolisque scariosis, concavis inæqualibus: bractea atro-fusca conspicua, ovata, acuminata, ad 5 mm longa et 3 mm lata, extus laxe villosula, post lapsum perianthii superstiti; 2 bracteolis appressis præter nervum medium fuscum pilosiusculum \pm hyalinis, nitentibus, subglabris, rotundis, 3,5 cm latis, apicem versus subserrulatis, in cuspidem setaceam 1 mm longam productis.

Perianthium 5-partitum campanulato-patens, basim constrictam versus valde indurescens; tepalis linearibus obtusis, basi ima incrassata et indurata in tubum 1 mm longum (1,2 mm diam.), extus hirsutum angustatis et coalitis, inferne conspicue carinatis, rigidis, dorso inæqualiter pilosis (pilis ad 2 mm longis apicem haud æquantibus), bicoloratis, limbatis, areola mediana virescenti pubescentia abscondita, marginibus inferne ciliatis, superne roseis in apicem nudum, roseum, 1,8 mm longum, dilatatum, interdum recurvatum transeuntibus, inæqualibus: 2 exterioribus 7,5 mm longis, 1 mm latis, apice truncato, subdenticulato 1,5 mm lato, intus glabris; 3 interioribus 7 mm longis, 0,7 mm latis, apice subspathulato, eroso-denticulato 1,2 mm lato, intus in parte inferiore pilis crispis, intricatis, marginibus præcique orientibus indutis.

Stamina 5 inæqualia, plerumque 2–3 minora abortiva, basi dilatata (0,5 mm) in anulum minimum (0,1–0,2 mm altum) membranaceum, glabrum, tubo perianthii partim adnatum coalita; pseudostaminodiis nullis; filamentis fertilibus ligulatis, linearibus ad 4 mm longis, 0,15 mm latis, superne subulatis, antheris bilocularibus obscure flavis, subrotundis (0,6–0,7 mm diam.), dorso affixis. Ovarium subclavatum longe stipitatum, 1,5 mm latum, stipite incluso 2,8 mm longum (stipite 1 mm), apice villosa; stylo \pm excentrico, gracili ad 3 mm longo, glabro; stigmatibus distincte capitellato, papilloso.

Representative locality: WESTERN AUSTRALIA—near Wittenoom Gorge, about 100 miles south of Marble Bar (HOLOTYPE in NSW—K. McMahon, 1952; No. 33667).

P. carinatus is easily distinguished from all those species possessing a visible, naked, blunt and denticulate apex of their perianth-segments by its striking ciliate keel in the lower part of the tepals, a feature not observed until now in any previously described species.

3. *P. PSEUDOHELIPTEROIDES* G. Benl, *species nova*. [Fig. 3.]

Herba annua (?) pubescens pluricaulis, caulibus (ca. 10) ad 20 cm altis, basi 3,5 mm diam., erectis vel adscendentibus, foliosis, striatulis, primo tomentosiusculis—pilis circispiis nodulosis—dein subglabris, ramosis; ramis (4–10) \pm fastigiatis, mono- vel plurispicatis.

Folia alterna obscure viridia, pilis argenteis sericeis (3 mm longis) induta, 1–2 cm distantia, petiolata, summa inflorescentiam juvenilem \pm involventia; laminis oblongo-lanceolatis ad 3 cm longis, 0,8 cm latis, mucronatis (mucrone ca. 1 mm longo), basi in petiolos ad 0,7 cm longos contractis, integerrimis, nervo medio subtus prominente.

Spicae numerosae elongato-ovoideae, 2,2 cm longae, 1,4 cm latae, pedunculatae, subdense paniculatae; rhachi villosa. Flores (ca. 50) conferti straminei; bracteis bracteolisque inæqualibus conspicuis, glabris, scariosis, tenuibus, hyalinis, pallide succineis, lucidis, integerrimis, haud appressis, uninerviis, nervo in cuspidem (0,5 mm) producto: bractea inferiore \pm angustata, ovato-lanceolata, 6 mm longa, ad 2,5 mm lata, post lapsum perianthii superstiti, 2 bracteolis lateralibus ovoideis, 5 mm longis, 3 mm latis.

Perianthium pentaphyllum campanulato-patens, erectum, basim incrassatum, callosam, conicam, extus hirsutam versus indurescens; tepalis lineari-oblongis, distincte uninerviis, ecarinatis, rigidis, parte inferiore subcartilagineis, limbatis, parte mediana virescenti, apicem versus divaricatis, usque ad basim fere liberis, intus laevigatis extus hirsutis (pilis dorsalibus rectis, albidis ca. 2 mm longis, articulatis, apicem vix excedentibus), inæqualibus: 2 exterioribus ad 7 mm longis et 1,2 mm latis obtusis intus glabris (pilis paucis brevibus, nervo medio inferiore orientibus exceptis). marginibus hyalinis in apicem nudum, truncatum, serrulatum, 0,3 mm latum transeuntibus; 3 interioribus 6 mm longis, 1 mm latis acutis, intus opacis, basi pilis crispis, haud numerosis, imprimis marginibus orientibus indutis.

Stamina 5, omnia æqualia fertilia vel 1–2 sterilia, longiora (3 mm), basi modice dilatata in anulum brevem (ca. 0,2–0,4 mm), membranaceum, plerumque fimbriatum, basi callosæ perianthii adnatum coalita; pseudostaminodiis \pm imperfectis, fissis; filamentis filiformibus, antheras fertiles portantibus 2 mm longis, 0,05 mm, basim versus 0,1–0,3 mm latis, primo dilute fulvis, dein parte mediore \pm rufescentibus; antheris bilocularibus, ellipticis, obscure flavis 0,2 mm longis et 0,1 mm latis, dorso affixis.

Ovarium subglobosum, sessile ca. 1 mm longum, apice lanuginosum; stylo centrali glabro, 1,5 mm longo, basi, 0,1 mm diam.; stigmate papilloso inconspicuo.

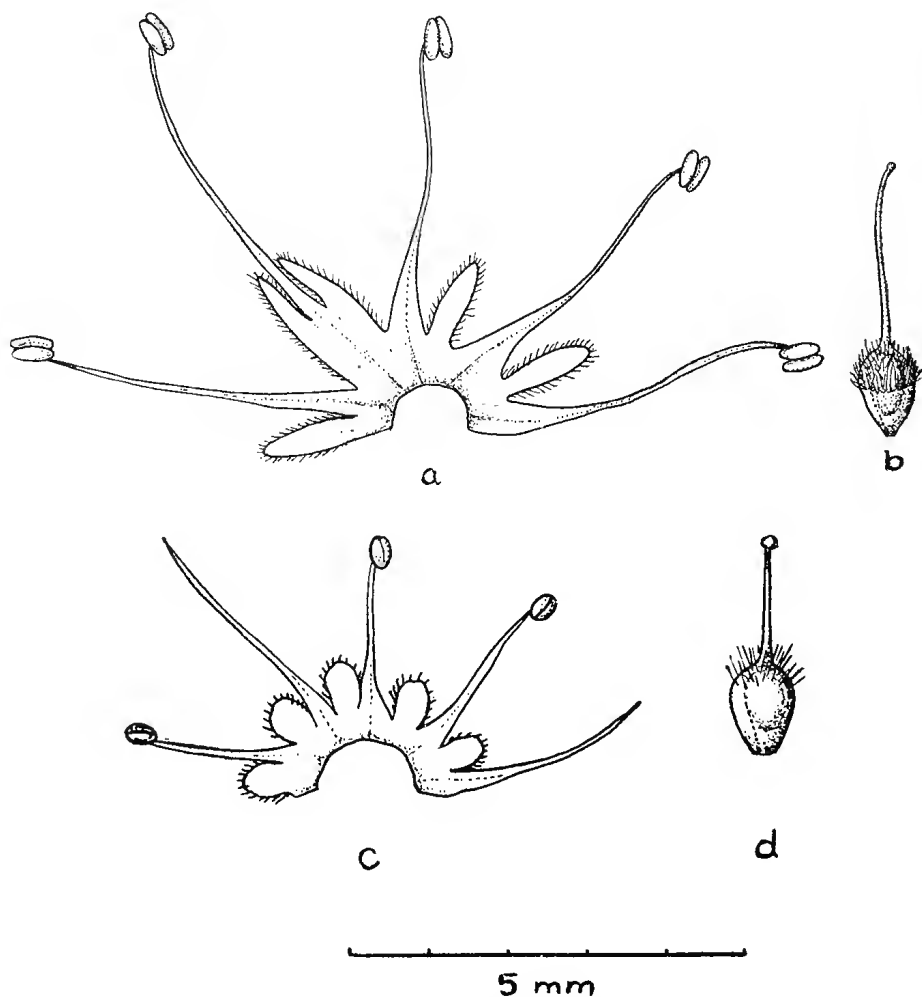


Fig. 3.—*Ptilotus helipteroides* (F. Muell.) F. Muell., var. *helipteroides*. (a) Staminal cup spread open, inner view; (b) pistil.—*Ptilotus pseudohelipteroides* G. Benl. (c) staminal cup spread open, inner view; (d) pistil.

Habitat: "On hard bare pebbly brown clay loam flats" (fide S. L. Everist).

Representative locality: QUEENSLAND (Gregory North District)—Currawilla, about 100 miles west of Windorah: Stallion Paddock (HOLOTYPE in CANB, ISOTYPES in BR1 and K—S. L. Everist, 9th June, 1949, No. 3937).

The present species bears in its general appearance some likeness to *P. helipteroides* (F. Muell.) F. Muell., var. *helipteroides*. But apart from numerous details in the structure of the leaves and especially of the flowers (Fig. 3) the latter is characterized by the red colour of its perianth-segments. Traces of red may be observed even in plants collected more than 46 years ago, while the three specimens of *P. pseudohelipteroides* found in 1949 by Mr. S. L. Everist and cited above do not show the least bit of red in their straw-coloured spikes. *P. helipteroides* is known from Northern Territory, from Western and South Australia, the new and really distinctive species comes from Queensland: the disjunction of the respective localities may be considered as an additional argument for separating the plant from *P. helipteroides*.

4. *P. DISSITIFLORUS* (F. Muell.) F. Muell., var. *LONGIFOLIUS* G. Benl, *varietas nova*.

Perennis haud tomentosa (rhachi excepta), minus ramosa. Recedit a typo speciei foliis glabris ad 7 cm longis, 5 mm latis, spicis floribusque maioribus, tepalis apicibus denticulatis, filamentis cupulam versus conspicuis (ad 0,45 mm) dilatatis.

TYPE from Port Denison, QUEENSLAND (North Kennedy) (HOLOTYPE of variety in MEL—E. Fitzalan, 1874).

The variety differs from the typical form primarily in the longer, narrower and glabrous leaves, thus resembling in its habit of foliage *P. distans* (R. Br.) Poir., from which it is, of course, well distinguished by its floral structure. This had already been stated in 1951 by Miss C. I. Skewes (MEL).

5. *P. LANATUS* A. Cunn. ex Moq., var. *GLABROBRACTEATUS* G. Benl, *varietas nova*, [Fig. 4.]

Rhachis minus villosa; bractea 3,5 mm longa lanam rhachis multo excedens, glabra (ima basi interdum excepta), bracteolae 2 mm longae apicem versus vix pilosulae; pili tepalorum minus densi, crispiores.

Representative localities: WESTERN AUSTRALIA—near King Sound (HOLOTYPE of variety in MEL, ISOTYPES in NSW and K—W. W. Froggatt, 1887); Balmaningarra, Northern Kimberley District (in K and NSW—H. Basedow, April, 1916, No. 74).

The distinguishing feature of the above variety is the different size of the bract and bracteoles, and their lack of pubescence, as Fig. 4 shows.

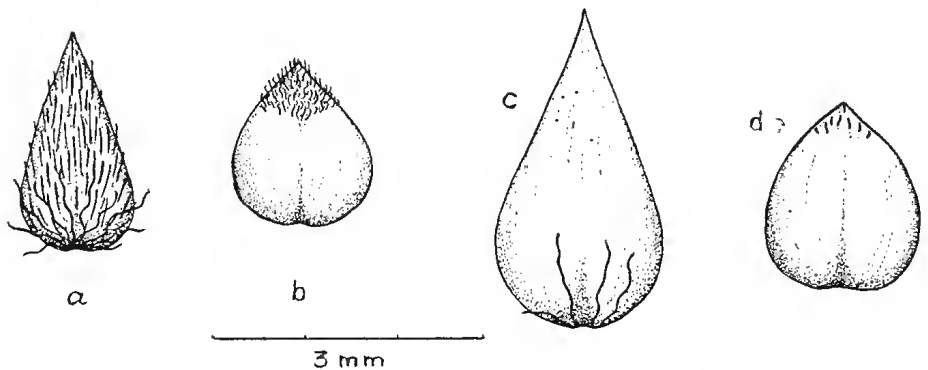


Fig. 4.—*Ptilotus lanatus* A. Cunn. ex Moq., var. *lanatus*. (a) bract; (b) bracteole.—*Ptilotus lanatus* A. Cunn. ex Moq., var. *glabrobracteatus* G. Benl. (c) bract; (d) bracteole.

6. *P. STIRLINGII* (Lindl.) F. Muell., var. *PUMILUS* G. Benl, *varietas nova*.

Planta pumila, caulibus (10) ex rhizomate (4 mm diam.) orientibus dense collocatis, albido-tomentosis, 7–12 cm longis, mono- ad tetrastachyis; foliis pilosis inferioribus ad 3,5 cm, superioribus vix 0,8 cm longis; spicis hemisphaericis 1,5 cm diam., rhachi lanuginosa, bractea 3,5 mm longa et 1,5 mm lata, extus villosa, bracteolis 4 mm longis, 2 mm latis, tubo perianthii 1,2 mm longo; tepalis extus pilis spinuloso-articulatis 4 mm longis obtectis, exterioribus 8,5 mm, interioribus 7,5 mm longis; staminibus fertilibus (2) 4–5 mm longis; ovario glabro 2 mm, stylo 3 mm longo.

TYPE from Sharks Bay, WESTERN AUSTRALIA (HOLOTYPE of variety in MEL—*F. Mueller*, Oct., 1877).

This plant looks like a dwarf of the usual form of the species, with a denser indumentum of the perianth-segments. Further differences—regarding proportions of floral organs—are brought out by closer examination.

The new species and varieties presented above were found out of a total of more than 3,000 specimens of *PTILOTUS/TRICHINIUM* from European, American and Australian herbaria. The study of the Australian material was made possible to me by the courtesy of Mr. R. H. Anderson (Botanic Gardens, Sydney), Miss N. T. Burbidge (C.S.I.R.O., Division of Plant Industry, Canberra), Miss C. M. Eardley (University of Adelaide, Department of Botany), Mr. S. L. Everist (Botanic Museum and Herbarium, Brisbane), Mr. A. W. Jessep (Melbourne Botanic Gardens and National Herbarium of Victoria, South Yarra), Dr. R. T. Patton and Miss E. M. Packe (University of Melbourne, Botany Department), and of Miss C. I. Skewes (National Herbarium of Victoria, South Yarra). A considerable number of sheets were generously sent to our Munich State Collection as a gift by the National Herbarium of New South Wales (Mr. R. H. Anderson), the Herbarium of the Division of Plant Industry, Commonwealth Scientific and Industrial Research Organization (C.S.I.R.O.), Canberra (Miss N. T. Burbidge), the Queensland Herbarium, Brisbane (Mr. S. L. Everist), and by Mrs. H. E. Ramsay, Red Cliffs, Victoria.

I am much indebted to all the above-mentioned authorities and institutes, and I take the opportunity of thanking them sincerely for the valuable help received.

REINSTATEMENT OF *CALOTIS SUFFRUTICOSA* Domin (Compositae).

by

GWENDA L. DAVIS.

(Department of Botany, University of New England, Armidale, N.S.W.)

In my revision of the genus *Calotis* R. Br. [*Proc. Linn. Soc. N.S.W.* 77: 171 1952] I concluded that *C. suffruticosa* Domin was conspecific with *C. lappulacea* Benth. and reduced it to synonymy. No type material was available in Australia and, from the original description, it seemed that the points of difference noted by Domin were insufficient to justify specific status.

Since then, however, specimens have come to hand collected not far from the type locality of *C. suffruticosa* which are undoubtedly this species and quite distinct from, although similar to, *C. lappulacea*.

C. suffruticosa Domin is accordingly removed from synonymy under *C. lappulacea* and reinstated as a good species.

The original description is reproduced below, translated from the Latin, together with supplementary notes and figures based on the recent material. I am indebted to Dr. Adair Dale of the Classics Department, University of New England, for this translation.

***C. suffruticosa* Domin in *Bibl. bot., Stuttgart* 89: 655 (1929).**

"A much-branched, erect sub-shrub about half a meter in height with a stem which is thick and woody at the base; the branches slender, erect, close together and almost twig-like, slightly hirsute or entirely glabrous, leafy. *Leaves* linear, flat, acute, slightly appressed, hirsute, entire or occasionally linear-cuneate, with acute teeth on both sides; the larger ones nearly 2 cm. long and 3 mm. broad. *Inflorescences* numerous, 1 cm. or more in diameter across the receptacle. *Involucre* campanulate, with many bracts which are narrow oblong-elliptical, very flat, smooth and at least 5 mm. long. *Fruits* muricate with two rigid, elongate, divergent bristles at least 3 mm. long, bearing short recurved spines; the apex of the fruit bears a ring of very short bristles about 0.5 mm. or a little more in length.

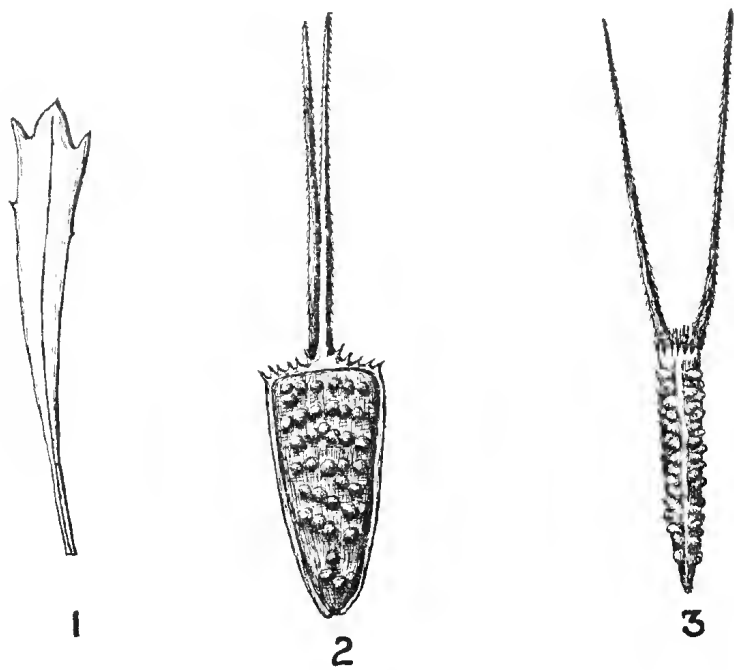
Queensland: Savannah woodland near Jericho (Domin III., 1929).

Related to *C. lappulacea* Benth. but differing in the involucre, the fact that the capitula are twice the size, and that the fruits bear two elongate awns and many short ones."

Supplementary Notes.

Material: 12 miles south-east of Muttaborra on the Aramac-road, western Queensland, open grassy plains, flowers bright yellow to orange, 9.9.1956, *N.T. Burbidge* (CANB. 5521; BRI; MEL).

Cauline leaves sessile, acute; the lower leaves up to 5 cm. long, 1 cm. broad, linear-cuneate, acutely toothed distally, becoming entire and broad-linear higher up the stem. *Involucral bracts* obtuse, torn-ciliate. *Ray florets* numerous, in several rows, the rays 4.5 mm. long, 0.5 mm. broad. *Fruits* cuneate, flattened, light brown, finely tuberculate.



Calotis suffruticosa Domin.

1. Lower cauline leaf, $\times 1$.

2-3. Fruit. Outer and lateral surfaces, $\times 15$.

TWO NEW AUSTRALIAN SPECIES OF BRACHYCOME Cass.
(Compositæ)

by

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SUB-GENUS EUBRACHYCOME.

BRACHYCOME TETRAPTEROCARPA G. L. Davis, *species nova*
[Fig. 1-3, p. 113.]

Herbæ adscendentes, pilis glandulosis, ad 30 cm. altæ, e basi ramosæ, folia radicalia non nisi in herbis immaturis reperienda; folia caulina sessilia, ad 6 cm. longa, 1.5-2 mm. lata; peduncula nuda; capitula ad 50 numero, 1 cm. sine radiis transverse mensa; involucri phylla 18, 4 mm. longa, 1.5 mm. lata, arte lanceolata, obtuse acuta, glabra, marginibus minute denticulatis; flores radii 25-34; radii 5 mm. longi, 1.2 mm. lati, albi; receptaculum 5 mm. latum, 2 mm. altum, minime convexum; achænia 2 mm. longa, 2 mm. lata, late oblongata, suffusca, corpore levi, alis lateralibus valde incurvatis, integris, alis dorsalibus ventralibusque quibus margines undulatæ adsunt; pappus minutus albusque.

Ascending glandular-hairy herbs up to 30 cm. high, branching from the base. *Radical leaves* only present on young plants. *Cauline leaves* sessile, up to 6 cm. long, pinnatipartite with 9-11 acute, lanceolate segments about 6 mm. long, 1.5-2 mm. broad. *Peduncles* naked. *Capitula* up to 50, 1 cm. diameter excluding the rays. *Involucral bracts* 18, 4 mm. long, 1.5 mm. broad, narrow-lanceolate, bluntly acute, glabrous, with minutely denticulate margins. *Ray florets* 25-34; the rays 5 mm. long, 1.2 mm. broad, white. *Receptacle* 5 mm. broad, 2 mm. high, slightly convex. *Fruits* 2 mm. long, 2 mm. broad, broadly oblong, light-brown; the body smooth, with broad, strongly incurved, entire, lateral wings and narrow dorsal and ventral wings with undulate margins; pappus minute, white.

Holotype: 15 miles south-east of Muttaborra on Aramac-road, Queensland, "Open grassy downs, in small water channel", 9.9.1956, N. T. Burbidge (CANB. No. 5523).

Paratypes: Same collection (MEL; NSW; BRI; ADW.).

Specimens examined: Type series; Aramac (Qd), 7, 1950, W. Robertson (CANB. No. 1950).

The fruits of this species are unique in that they bear four longitudinal wings at equal distances around the glabrous poorly-defined body. The lateral wings are rather thick but are very similar in form to those of *B. curvicarpa*, whereas the dorsal and ventral wings are narrow and thin. This resemblance between the two species is seen also in the habit and vegetative features and suggests a close relationship.

In view of the fact that *B. tetrapterocarpa* is known only from the type district, it is possible that it originated as a local variant of *B. curvicarpa*, whose most northern record is Longreach, approximately 60 miles from both Muttaborra and Aramac.

SUB-GENUS METABRACHYCOME.

BRACHYCOME DIMORPHOCARPA G. L. Davis, *species nova* [Fig. 4-7, p. 113.]

Herbæ adscendentes aut infirme erectæ, ad 38 cm. altæ, multistipitatæ, ramosæ in partibus maturis minutissime septato-pilosæ, aliter pilis glandulosis; folia radicalia non nisi in herbis immaturis reperienda; folia caulina ad 3 cm. longa, late sessilia, pinnatisecta, segmentis 9-11 lanceolatis, breviter mucronatis, ad 9 mm. longis, 1.5 mm. latis; pedunculi filiformes, nudi, glandulosi; capitula 50-100, fere ad 5 mm. (sine radiis) transverse metientia; involucri phylla 16, 3 mm. longa, 0.9 mm. lata, oblanceolata, acuta, glandulosa, marginibus minutissime serrulatis; flores radii 12-20, ligulis 4-6 mm. longis, 0.8-1 mm. latis, violaceis; receptaculum alte convexum, 1.4 mm. latum, 0.8-1 mm. altum; achænia dimorphica—radiatorum 1.5 mm. longa, 0.5 mm. lata, fusca, clavata, compressa, alte tuberculata, marginibus levibus, pappo albo minutissimoque; discorum autem 1.7 mm. longa, 1.3 mm. lata, corpore valde fusco glabro, pilis glandulosis paucis lineam erectam mediam utrinque formantibus, alis lateralibus latis integris albis aut subluteis apicem versus perimplicatis atque secus marginem a pilis parvis glandulosis instructis, pappo albo minutoque.

Ascending or weakly erect herbs, up to 38 cm. high, many stemmed, branching, minutely septate-hairy on mature parts, otherwise with glandular hairs. *Radical leaves* only present on young plants. *Cauline leaves* up to 3 cm. long, broadly sessile, pinnatisect with 9-11 lanceolate, shortly mucronate segments, up to 9 mm. long, 1.5 mm. broad. *Peduncles* filiform, naked, glandular. *Capitula* 50-100, about 5 mm. diameter, excluding the rays. *Involucral bracts* 16, 3 mm. long, 0.9 mm. broad, oblanceolate, acute, glandular, with minutely serrulate margins. *Ray florets* 12-30, the rays 4-6 mm. long, 0.8-1 mm. broad, mauve. *Receptacle* steeply convex, 1.4 mm. broad, 0.8-1 mm. high. *Fruits* dimorphic, those of the ray 1.5 mm. long, 0.5 mm. broad, brown, clavate, flattened, deeply tuberculate with smooth margins; pappus white, microscopic. *Disc fruits* 1.7 mm. long, 1.3 mm. broad, the body dark-brown, smooth with a few glandular hairs down the centre of each face; lateral wings broad, entire, white to pale yellowish-brown, strongly infolded distally, with small marginal glandular hairs.

Holotype: Bon Bon Station to Kingoonya, South Australia. "Low wash in red sand country with Myall (*Acacia sowdenii* Maiden)", 11.10.1955, N. T. Burbidge and M. Gray (CANB. No. 4653).

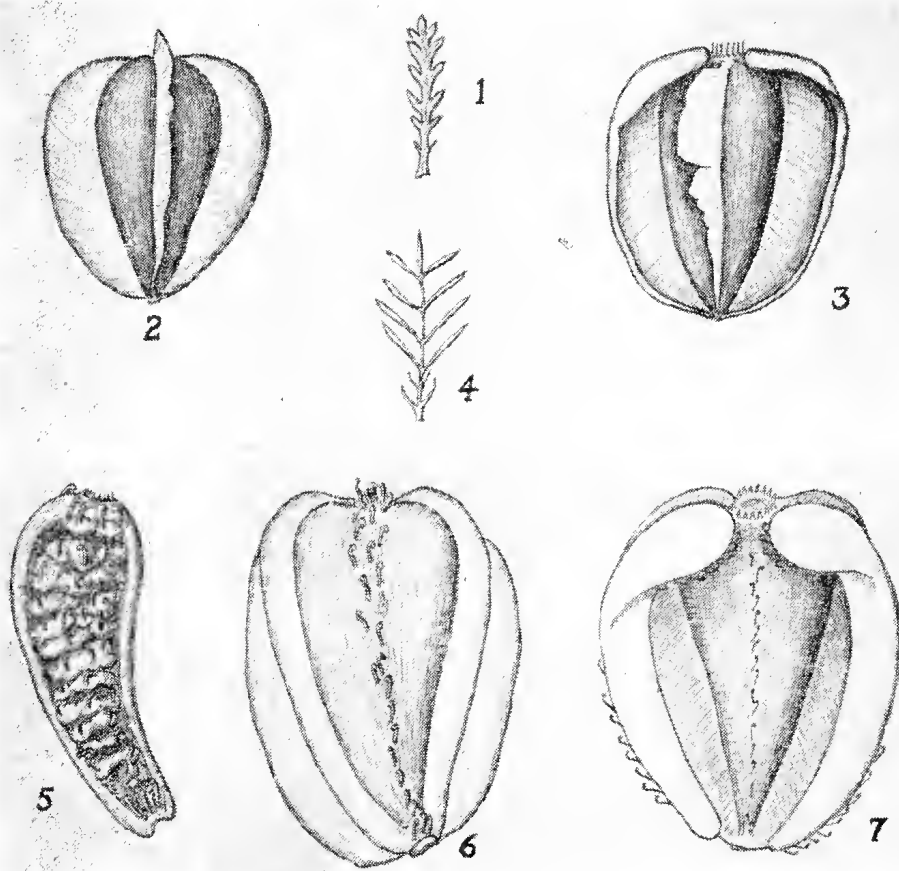
Paratypes: Same collection (MEL; NSW; ADW; BRI).

The vegetative similarity of this species with *B. ciliaris* (Labill.) Less., together with the presence of dimorphic fruits, indicates a close relationship, particularly with *B. ciliaris* var. *lanuginosa* (Steetz) Benth. The disc fruits of *B. dimorphocarpa*, however, are quite distinct in the curved and infolded nature of their lateral wings.

Mr. Gray, in personal communication, described the wings of the fruits as being "a most effective aid to wind-dispersal as they spin off at a great rate when the wind catches them".

B. dimorphocarpa is only recorded from the type locality, near Kingoonya, South Australia, but there is a possibility that, owing to its close vegetative resemblance to *B. ciliaris*, it has not been recognized elsewhere as distinct.

I am indebted to Dr. Adair Dale of the Classics Department, University of New England, for supplying the Latin diagnoses of these species.



Brachycome tetrapterocarpa.

- 1. Lower cauline leaf, x 1.
- 2-3. Fruit. Outer and inner surfaces, x 15.

B. dimorphocarpa.

- 4. Lower cauline leaf, x 1.
- 5. Ray fruit, x 30.
- 6-7. Disc fruit. Outer and inner surfaces, x 30.

STUDIES IN MIMOSACEAE—Part 1.

by

A. B. COURT,

National Herbarium of Victoria.

ACACIA FLEXIFOLIA A. Cunn. ex Benth., A NEW RECORD FOR VICTORIA

H. B. Williamson in A. J. Ewart *Flor. Vict.* 587 (1931) confounded *A. flexifolia* A. Cunn. ex Benth. in Hook. *Lond. J. Bot.* 1:359 (1842) with *A. lineata* A. Cunn. ex G. Don *Gen. Syst.* 2:403 (1832) although these two species differ very markedly in several important respects. Hitherto, *A. flexifolia* had been recorded as endemic in New South Wales, but now it must be added formally to the Victorian flora on the basis of the collections listed below.

KEY DIFFERENCES BETWEEN THE TWO SPECIES.

A. flexifolia: Narrow greyish-green virgate shrub to 1.5 m. high; branches *glabrous*, with prominent *scaly resinous ridges*; phyllodes quite *glabrous*, more or less linear, broadening towards their apices, usually *bent sharply near their bases*; apices of phyllodes rounded but sometimes with a very small point; peduncles ca. 3 mm. long or less, appearing *farinaceous*; flowers 3–8 (*rarely more*) *per head*, appearing May to October.

A. lineata: Spreading greenish, or sometimes greenish-yellow, shrub to 2 m. high and often as broad; extremities (at least) of branches *pubescent*, *not prominently resinous*; phyllodes usually *pubescent*, more or less simply linear, broader near their centres, usually acute; peduncles ca. 8–10 mm. long (*sometimes more*), usually quite *glabrous* but *never appearing farinaceous*; flowers 10–15 (*rarely less*) *per head*, appearing July to October.

DISTRIBUTION NOTES.

The most westerly record for *A. flexifolia* in Victoria is the Whipstick Scrub near Bendigo and the most easterly locality for *A. lineata* lies about 15 miles to the west at Inglewood. These two species are represented in the National Herbarium of Victoria by the following collections:

A. flexifolia—Whipstick forest near Bendigo, D. J. Paton, May, 1918; Bendigo, C. S. Sutton, s.n., 12/9/1920; Bendigo, D. J. Paton, s.n., October 1922; Central Whipstick near Bendigo, W. Perry, s.n., 1946; Central Whipstick Scrub near Bendigo, W. Perry, s.n., 27/12/1953; Central Whipstick near Bendigo, W. Perry, s.n., 20/11/1955; In hard soil amongst mallee in Whipstick Scrub ca. 8 km. (5 miles) north from Huntly near Bendigo, A. B. Court, n. 941, November 4, 1958; Earlston via Violet Town, R. A. Black, s.n., 13/9/1944; Forest Sanctuary Reserve, Reef Hill, about 1 mile south of Benalla, H. C. E. Stewart, s.n., 15/6/1959.

A. lineata—Mallee District, N. W. Vict., St. Eloy D'Alton, s.n., October, 1899; Kurting, N. W. Victoria, A. Purdie, s.n., 1894; North Western Desert of Victoria, L. Morton, s.n., s.d.; 15 Miles from Nhill in the direction of Lake Hindmarsh, St. Eloy D'Alton, s.n., June, 1892; Nhill, St. Eloy D'Alton, s.n., 31/3/1897; In sandy soil beside Lillimur-AMP road ca. 25 km. (15 miles) north from Lillimur North, A. B. Court, n. 1310, October 14, 1958.



